April 2021

Binder 075, Fellodistomatidae P [Trematoda Taxon Notebooks]

Harold W. Manter Laboratory of Parasitology

Fellodistomidae

Fellodistomatidae

Paradiscogaster Yamaguti, 1934

Generic diagnosis. — Fellodistomidae, Discogasteroidinae: Body small, pyriform, spined. Oral sucker subterminal; pharynx small; esophagus moderately long; ceca very short. Acetabulum large, discoid, emarginate at anterior and posterior borders, near posterior extremity. Testes symmetrical, in posterior half of body; cirrus pouch elliptical, overlapping acetabulum posteriorly, containing bipartite seminal vesicle and well developed prostatic complex. Cirrus projecting into genital atrium. Genital pore near intestinal bifurcation. Ovary in front of and between two testes. Receptaculum seminis present. Vitellaria follicular; surrounding intestinal ceca. Uterus winding between and posterior to two testes and dorsal to acetabulum. Excretory vesicle? Parasites of marine fishes.

Genotype: *P. piriformis* Yamaguti, 1934 (Pl. II, Fig. 18) in a pleuronectid fish; Ise Bay, Japan.

Other species: *P. chaetodontis* Yamaguti, 1938 (Pl. 2, Fig. 15) in intestine of *Chaetodon collaris*, Koti, Japan, also in *Chaetodon strigangutus* and *C. trifasciatus;* Okinawa.

P. caranxi (Srivastava, 1939) (syn. *Discogasteroides c.* S.) in *Caranx kalla;* Bay of Bengal.

Fellodistomidae

Paradiscogaster n. s. Yamaguti, 1934

GENERIC DIAGNOSIS. Fellodistomidae Nicoll, 1913; Discogasterinae (v.s.). Body pear-shaped, armed with scale-like spines. Oral sucker ventroterminal. Ventral adhesive organ approximately quadrate, with more or less concave anterior and posterior borders at junction of middle with caudal third of body. Prepharynx present. Pharynx small. Esophagus fairly long, bifurcating at about one third of body length from anterior extremity of body. Ceca very short. Testes symmetrical or slightly oblique, in posterior part of body and dorsal to adhesive organ. Cirrus pouch plump, containing relatively small bipartite vesicula seminalis, well developed pars prostatica and prostatic cells. Cirrus projecting into fairly large genital atrium. Genital pore just behind cecal bifurcation. Ovary pretesticular, dorsal to adhesive organ. Receptaculum seminis present. Laurer's canal? Vitellarium follicular, aggregated around ceca. Uterus extending between testes and adhesive organ to near posterior extremity of body. Eggs not very numerous, oval. Excretory system? Parasitic in marine fishes.

Genotype. *Paradiscogaster pyriformis*.

Paradiscogaster pyriformis Yamaguti, 1934 n. sp.

SPECIFIC DIAGNOSIS. *Paradiscogaster*; with generic characters. Body 0.74–0.91 × 0.4–0.55 mm. Oral sucker 0.095–0.13 mm in diameter. Pharynx 0.042–0.06 mm long. Adhesive organ 0.28–0.34 mm in transverse diameter. Testes globular to oval, entire, 0.1–0.2 × 0.074–0.13 mm. Ovary globular to oval, entire, 0.063–0.11 × 0.1–0.12 mm. Eggs 0.024–0.03 × 0.016–0.018 mm.

Habitat. Small intestine of a pleuronectid (Japanese local name Hôsô-garei.)
Locality and date. Ise Bay; April 18, 1929.
Type and paratypes in my collection.

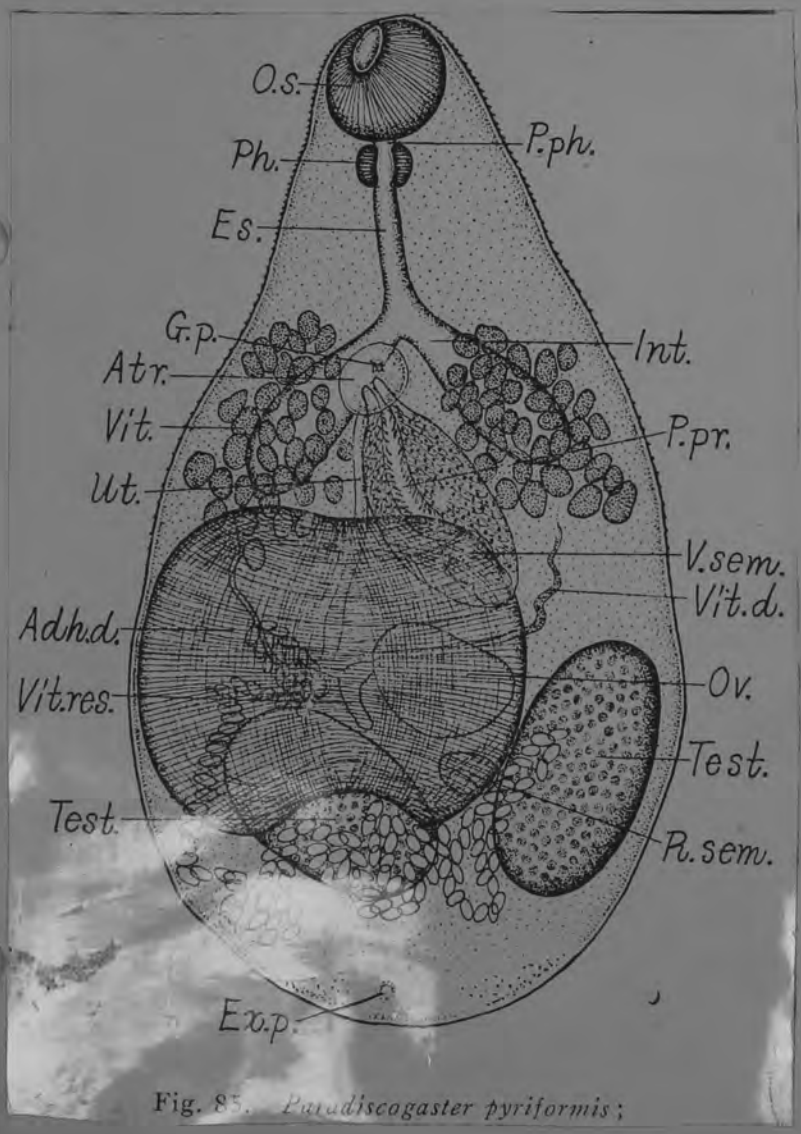


Fig. 85. *Paradiscogaster pyriformis*;

DISCUSSION. This genus is closely allied to the foregoing *Discogaster*, but differs chiefly in the length of the esophagus, in the character of the cirrus pouch, in the character and the extent of the vitellarium, etc.

20. *Paradiscogaster piriformis* Yamaguti, 1934.

Habitat. Small intestine of *Pleuronichthys cornutus* (Temm. et Schleg.)[1].

Locality and date. Tokoname, Aiti Prefecture; April 17, 1941.

Eight full-grown specimens fixed in acetic sublimate under cover glass pressure, stained and mounted, gave greater measurements than the original as follows.

Body 1.0 – 1.83 × 0.5 – 1.08 mm; oral sucker 0.1 – 0.175 × 0.1 – 0.175 mm; pharynx 57 – 81 × 54 – 78 μ; esophagus 0.07 – 0.21 mm long; intestine 0.18 – 0.3 mm long; acetabulum 0.3 – 0.42 × 0.3 – 0.6 mm; testes 0.16 – 0.26 × 0.12 – 0.175 mm; cirrus pouch 0.24 – 0.4 × 0.12 – 0.21 mm; anterior portion of vesicula seminalis 45 – 84 × 50 – 123 μ, posterior portion 45 – 111 × 50 – 135 μ; ovary 0.12 – 0.21 × 0.11 – 0.17 mm; receptaculum seminis 90 – 130 × 45 – 100 μ. Eggs embryonated, 24 – 33 × 15 – 18 μ in life.

In the fresh state the posterior extremity may be produced backward by cover glass pressure in the form of a blunt-pointed cone, at the top of which the excretory pore opens. The main lateral excretory stems of the two sides join together at the excretory pore, so that there is no typical excretory vesicle. Each of them bifurcates at the level of the anterior part of the esophagus into a short anterior and a long posterior collecting vessel.

Paradiscogaster aluteri ~~n. sp.~~ Machida, 1972

A survey was made on parasites of the sea fishes at Fukaura, on the southern coast of the Bungo Channel, Ehime Prefecture, Shikoku Island, Japan, in May, 1972. In this survey, a new digenetic trematode belonging to the family Fellodistomidae was obtained from the small intestine of the leatherjacket, *Aluterus monoceros*. The specimens were fixed in acetic sublimate under cover glass pressure, stained with Heidenhain's hematoxylin and mounted in balsam. All specimens are deposited in the Department of Zoology, National Science Museum, Tokyo.

Host. *Aluterus monoceros* (Linnaeus); family Aluteridae.

Location. Small intestine.

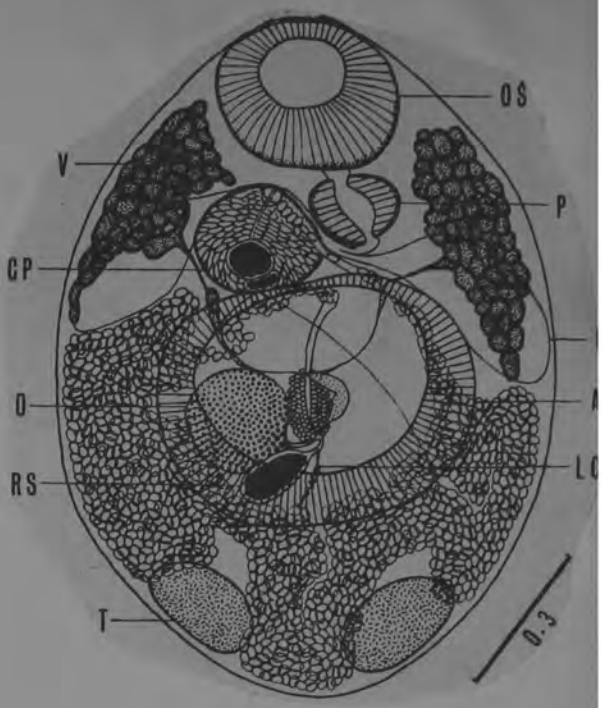
Locality. Southern Bungo Channel, Ehime Prefecture, Shikoku Island, Japan.

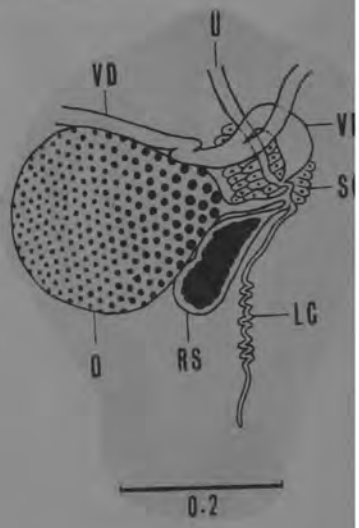
Date. May 21 and 24, 1972.

Frequency. Three to 30, in three out of five hosts examined.

Description. Based on ten specimens. Body oval, 1.17–1.62 mm long by 0.91–1.22 mm wide. Cuticle with minute squamules except for posterior part of body. Oral sucker terminal, rounded, 0.243–0.354×0.350–0.468 mm; prepharynx short, about 0.1 mm long; pharynx globular, 0.122–0.162×0.132–0.278 mm; esophagus short, 0.062–0.075 mm long, bifurcating about middle of anterior half of body; caeca saccular, terminating near equator. Acetabulum very large, rounded, 0.390–0.587×0.576–0.830 mm, with its center somewhat behind middle of body, sometimes with ripple orifice which reddish in colour in life. Sucker ratio 1 : 1.56–1.85. Testes oval or elliptical, 0.20–0.33×0.111–0.162 mm, situated symmetrically at variable levels in hindbody, i.e., in holotype they situated at posterior end of body, while in some paratypes they located at level of posterior margin of acetabulum; each vas efferens running into seminal vesicle at posterior end of cirrus pouch; cirrus pouch oval, well developed, 0.202–0.405×0.233–0.314 mm, lying pre-equator, containing bipartite seminal vesicle, pars prostatica and prostatic cells; short cirrus, 0.080×0.060 mm, always protruded into a fairly wide genital atrium; genital pore situated almost median at level of posterior end of pharynx. Ovary rounded, 0.125–0.243×0.101–0.223 mm, submedian, postequatorial, pretesticular; receptaculum seminis elliptical, 0.091–0.22×0.071–0.162 mm, obliquely posterodexter to ovary; Laurer's canal winding and opening medially at posterior margin of acetabulum dorsad. Vitellaria consisting of many irregularly lobed small follicles, extending symmetrically from level of posterior part of oral sucker to caecal termination; vitelline ducts united with each

(over)





other at middle of body to form short tubular vitelline reservoir. Uterus first ascending to near caudal end of cirrus pouch, descending on right side towards posterior extremity of body, then ascending on left side of body to form short metraterm which opens into genital atrium along with cirrus. Eggs oval, embryonated, relatively thick-shelled, 0.026–0.036×0.015–0.019 mm in balsam. Excretory vesicle Y-shaped, extending to posterior margin of acetabulum, pore terminal.

Discussion. The genus *Paradiscogaster* contains seven species: *P. pyriformis* Yamaguti, 1934; *P. chaetodontis* Yamaguti, 1938; *P. manteri* Kurochkin, 1970; *P. eniwetokensis* Martin et Hammerich, 1970; *P. farooqii* Hafeezullah et Siddiqi, 1970; *P. yamagutii* Hafeezullah et Siddiqi, 1970 (=*P. chaetodontis okinawaensis* Yamaguti, 1971); *P. drepanei* Mamaev, 1970. The present new species differs from all of them in having larger pharynx, small sucker ratio and in the vitellaria being extended more anteriorly. The vas efferens does not unite with each other to form vas deferens before entering into the cirrrus pouch, though there are no descriptions of the vas efferens except for *P. pyriformis*, *P. chaetodontis* and *P. yamagutii*.

Paradiscogaster chaetodontis Yamaguti,1938

Length 1. to 2.1 width 0.45 to 0.9, with a blunt pointed tail cone; with fine spines
Oral# sucker 0.11 to 0. 2 mm in diameter
Acetabulum (adhesive disc) 0.3 to 0.77 wide, just post equatorial, its anterior and posterior margins undulating.
Testes subglobular almost symmetrical, posterodorsal to adhesive organ.
Cirrus sac nearly fusiform, 0.3 to 0.51 by 0.075 to 0.15 in median line between bifrucation and adhesive organ.
Seminal vesicle indistinctly bipartite.
Cirrus projecting as a conical papilla.
Genital pore immediately behind bifurcation.
Ovary subglobular, smaller than testes, anterodextral to left testis
Eggs 42 to 48 by 21 to 27 u
Vitellaria forming a grape-like bunch at posterior end of each cecum.
Host: Chaetodon collaris
Japan; Koti

Compare with P.piriformis, differing in egg size and tail cone.

Note. This is not same species as P. chaetodontis Yam., 1942 egg size etc

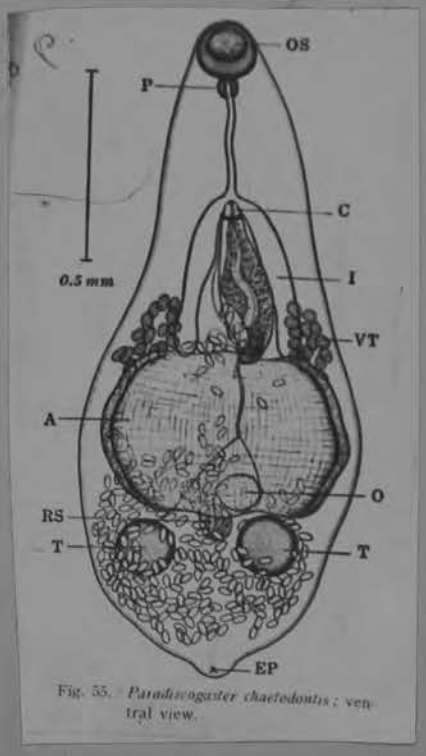


Fig. 55. *Paradiscogaster chaetodontis*; ventral view.

Fellodistomatidae

Paradiscogaster chaetodontis Yamaguti,1942

Length 1. to 1.8; width 0.5 to 0.7 mm; spined anteriorly
Oral sucker 0.15 to 0.2 wide; acetabulum very large, discoid, broader than long, 0.37 to 0.63, at middle third
Sucker ratio :
Prepharynx very short; esophagus 45 to 100 u long, bifurcating at about middle of anterior third.
Ceca narrow divergent ending at posterior end of anterior third or anterior end of middle third, a little in front of acetab.
Testes oval to elliptical, symmetrical just behind acetabulum.
Cirrus sac elliptical extending oblique from anterior border of acetabulum to genital pore, containing a bipartite internal seminal vesicle. Cirrus short often protruded into metraterm.
Genital pore median or slightly to right or left shortly behind bifurcation.
Ovary subglobular to oval posterodorsal to acetabulum, usually to the right just in front of testicular zone.
Sem. rec. rounded
Uterus filling hindbody
Vitellaria a compact mass of 8 to 10 on each side, immediately behind cecal end.
Eggs 21 to 27 by 11 to 15 u.
Excretory system not well seen; ex. vesicle not reaching to middle of posterior third.

Host: Chaetodon strigangutus (Gmelin) type host
C.trifasciatus

Japan; Okinawa

Note This is not same species as P. chaetodontis Yam., 1938
199 eggs, etc.

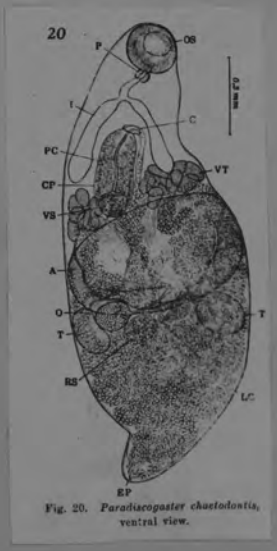


Fig. 20. *Paradiscogaster chaetodontis*, ventral view.

Paradiscogaster drepanei sp. nov.

Рис. 11

Хозяин: *Drepane punctata, D. longimana.*

Локализация: кишечник.

Место и время обнаружения: Тонкинский залив, июль 1960 г.

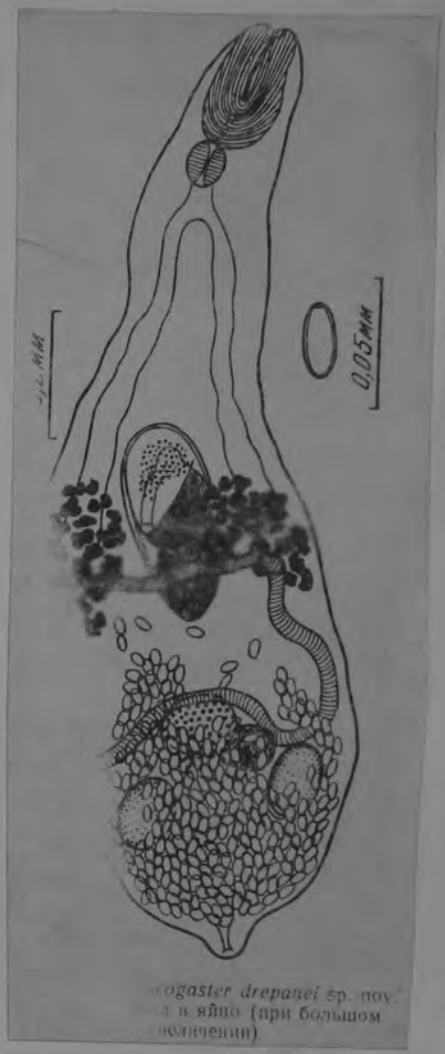
Экстенсивность встречаемости: у *Drepane punctata*, 5,2%, от 1 до 3 у *D. longimana*, у 3 из 8 исследованных рыб, 1, 4 и 8 экз.

Описание (типовой экземпляр от *D. punctata*). Мелкая, грушевидная форма тела, длиной 1,56 *мм* и максимальной шириной 0,51 *мм*, в задней части тела. Ротовая присоска субапикальная, удлиненная, размером 0,21×0,13 *мм*. Префаринкс очень короткий, фаринкс 0,064×0,056 *мм*. Пищевод выражен слабо, кишечные ветви довольно широкие и короткие, доходят лишь до переднего края брюшной присоски (Скрябин и Коваль, называют ее «диском Ямагути»). Последняя расположена в задней трети тела и имеет характерную форму: она поперечно вытянутая, почти полукруглая, с узким волнистым краем. Длина брюшной присоски 0,37 *мм*, ширина 0,48 *мм*.

Семенники, размерами 0,13×0,09 и 0,12×0,09 *мм*, лежат диагонально по краям тела позади брюшной присоски. Крупная бурса, изогнутая в виде знака вопроса в дорзо-вентральной плоскости, открывается у переднего края брюшной присоски. Внутри бурсы — небольшой двураздельный семенной пузырек и простатическая часть, состоящая из мелких круглых клеток. Половое отверстие открывается впереди переднего края брюшной присоски.

Яичник округлый, 0,092 *мм* в диаметре, расположен медианно впереди переднего края брюшной присоски; рядом с ним — крупный семяприемник. Желточники в виде двух гроздей крупных фолликулов у концов кишечных ветвей впереди брюшной присоски. Петли матки заполняют все свободное пространство в заднем конце тела позади брюшной присоски. Яйца удлиненно-овальные, 0,028×0,015 *мм*. Небольшой мешковидный экскреторный пузырь открывается отверстием на сосцевидном выросте заднего конца тела.

Изменчивость признаков. Размеры тела колеблются: длина 0,83—1,60 *мм*, ширина 0,40—0,51 *мм*. Ротовая присоска 0,21—0,25×0,13—0,15 *мм*, фаринкс 0,058—0,064×0,056—0,058 *мм*, брюшная присоска 0,37—0,42×0,40—0,48 *мм*. Очень характерна форма бурсы — всегда в виде вопросительного знака. Желточники всегда впереди брюшной присоски, лишь несколько заходят за ее передний край. Размеры яиц 0,028—0,031×0,015—0,016 *мм*.



Paradiscogaster drepanei sp. nov.: взрослая и яйцо (при большом увеличении)

—over—

Систематическое положение. Описанный вид трематод, с одной стороны, близок к роду *Discogasteroides* Strand, 1934, с другой — к *Paradiscogaster* Yamaguti, 1934. Эти роды различаются, согласно Скрябину и Коваль (1957), тем, что представители первого имеют короткий, а второго — длинный пищевод; по мнению же Ямагути (Yamaguti, 1958), тем, что у первых желточники лежат по бокам брюшной присоски, а у вторых — перед брюшной присоской на уровне концов кишечных ветвей. Длине пищевода Ямагути не придает никакого значения. Найденные нами трематоды обладают признаками как того, так и

[illegible] имеют короткий пищевод и в то же время желточни-[illegible]ые впереди брюшной присоски. Тем не менее мы относим [illegible]*discogaster*, учитывая признак, на который ни один из [illegible]ов не обратил внимания: расположение полового отвер-[illegible] переднего края брюшной присоски. У представителей [illegible]*roides* половое отверстие находится близко к переднему [illegible]колько позади фаринкса, причем этот признак коррели-[illegible]ением желточников по бокам брюшной присоски.

[illegible]) причисляет к роду *Paradiscogaster* три вида: *P. pyri-*[illegible], *P. chaetodontis* Yam., 1938, *P. caranxi* (Srivastava, [illegible]*ogasteroides caranxi*). Последний вид ранее относился [illegible]*cogasteroides* Gupta, 1953, его Скрябин и Коваль (1957) [illegible] другое подсемейство — *Antorchane*. Несомненно, что [illegible] к роду *Paradiscogaster*, как это делает Ямагути [illegible] к этот вид имеет обычное для брюшной присоски [illegible] Зикостенный диск. Следовательно, в роде *Paradiscogaster* [illegible]е время остаются лишь два вида. От них описанный нами вид [illegible]ся: формой половой бурсы, которая согнута в виде вопросительного знака; двураздельным семенным пузырьком и коротким пищеводом.

Genus *Paradiscogaster* Yamaguti, 1934

Paradiscogaster eniwetokensis ~~n. sp.~~ Martin & Hamaguerich, 1970
Fig. 1

Body oval to pyriform, orange-red in life. Body length 0.42–0.6, body width 0.196–0.322. Tegument bearing fine spines over most of body. Oral sucker length (anterior-posterior) 0.065–0.090, width 0.087–0.106, subterminal. Acetabulum length 0.182–0.252, width 0.24, in midbody. Prepharynx very short; pharynx nearly spherical 0.028–0.037 long and 0.028–0.034 wide. Esophagus length varies with degree of extension of anterior part of body. Ceca short, saccular, reaching to acetabulum. Testes two in posterior part of body, side by side, oval, 0.062–0.078 long and 0.037–0.075 wide. Cirrus sac elongate, enclosing bipartite seminal vesicle, well-developed prostate complex and weakly developed cirrus, length 0.098–0.182, width 0.037–0.050, extending posteriorly from genital pore to overlap acetabulum. Genital pore ventral about midway between suckers when anterior part of body is extended, serves as exit for both male and female systems. Vitellaria lateral at level of anterior portion of acetabulum, 7 to 10 follicles on each side. Seminal receptacle spherical, sometimes larger than ovary, between ovary and testes in hind body. Ovary oval to spherical, usually on right side, a short distance anterior to testes in hind body, approximately 0.043 in diameter. Loops of uterus extending from near posterior end of body to near mid-acetabular level, then anteriad to genital pore. Eggs oval, 22–25μ long and 12–15μ wide, average 23μ long and 13μ wide.

HOST: *Chaetodon strigangulus* (Gmelin).

HABITAT: Intestine. 14 specimens

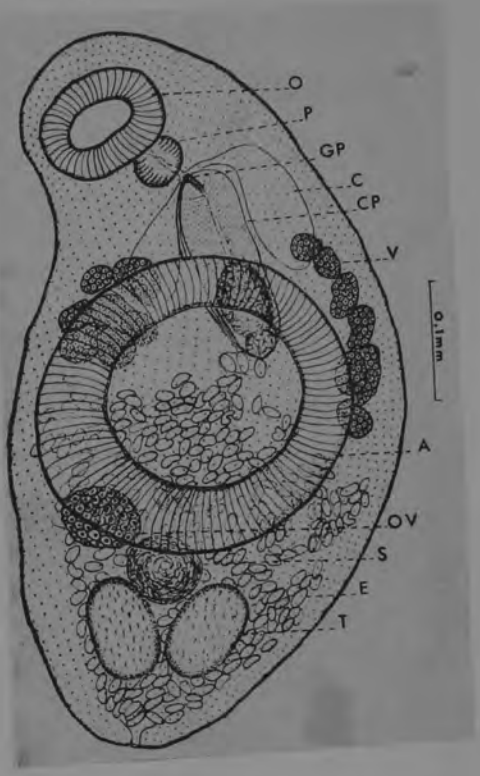
LOCALITY: Eniwetok, Marshall Islands.

DATE COLLECTED: February 23, 1957.

DEPOSITED: Type (circled on slide) and 5 paratypes in Hancock Foundation, Parasitology Collection, University of Southern California.

DISCUSSION

Yamaguti (1934) established the genus *Paradiscogaster* for *P. pyriformis* that he found in the small intestine of a pleuronectid fish caught in Japan, later (1951) designated *Pleuronichthys cornatus*. He has spelled this species name *piriformis* in later works (1938, 1953, 1958). Yamaguti (1938) described another species, *P. chaetodontis*, found in *Chaetodon collaris* in Japan and in *C. strigangulus* and *C. trifasciatus* in Okinawa. Srivastava



(1939) described *Discogasteroides caranxi* from the fish *Caranx kalla* obtained in the Bay of Bengal, India. Yamaguti (1953) transferred *Discogasteroides caranxi* to *Paradiscogaster*. *P. eniwetokensis* differs from all of these in having fewer vitelline follicles, not more than 10 on each side of the body, while other species have from 15 to 38. It has smaller eggs, suckers, ovary, cirrus pouch, and body size than all the other species. These differences could not be due to a difference of host in the case of *P. chaetodontis* for it was found in the same host, *Chaetodon strigangulus*.

***Paradiscogaster farooqii* sp. n.** 1970
Hafeezulah & Siddiqi, (Fig. 12)

Host: *Scatophagus argus* (L.); spotted butter fish; Scatophagidae.

Site: Intestine.

Number of specimens: 5.

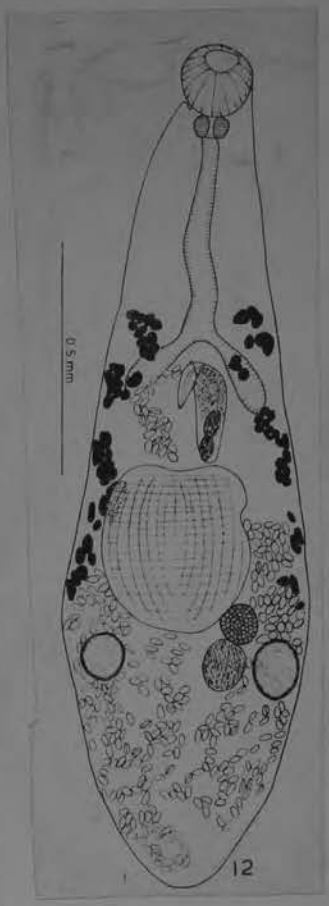
Locality: Tuticorin.

Holotype: USNM Helm. Coll. No. 63218.

Description (with measurements on 3 specimens 2 were not in good condition): Body 1.69 to 1.8 mm long, 0.46 to 0.54 mm wide, fusiform with rounded ends. Cuticle thin, spines not evident. Acetabulum 253 to 372 by 239 to 324, discoid emarginate, in middle third of body. Oral sucker 113 to 128 by 123 to 141, spherical, terminal. Prepharynx short; pharynx 36 to 45 by 51 to 66, spherical; esophagus 396 to 420 long; cecal bifurcation at 540 to 600 from anterior end of body; ceca short, saccular, club-shaped.

Testes 104 to 149 by 69 to 98, oval or spherical, symmetrical or subsymmetrical, posterolateral to acetabular disc. Cirrus sac elongate, distal end slightly curved to right, between cecal bifurcation and acetabular disc, containing bipartite seminal vesicle, long pars prostatica, and protrusible cirrus, mostly filled with prostatic gland cells. Genital pore postbifurcal, median or submedian.

Ovary 78 to 104 in diameter, spherical, posterosinistral to acetabular disc, pretesticular. Seminal receptacle large, spherical, immediately postovarian, between testes. Laurer's canal opening dorsally near posterior end of body. Vitellaria acinous, lateral, sparsely distributed from level of cecal bifurcation to ovary. Uterus voluminous, filling most of posterior part of body; metraterm undifferentiated. Eggs 27 to 31 by 15 to 18, thick-shelled, numerous. Excretory vesicle not observed.

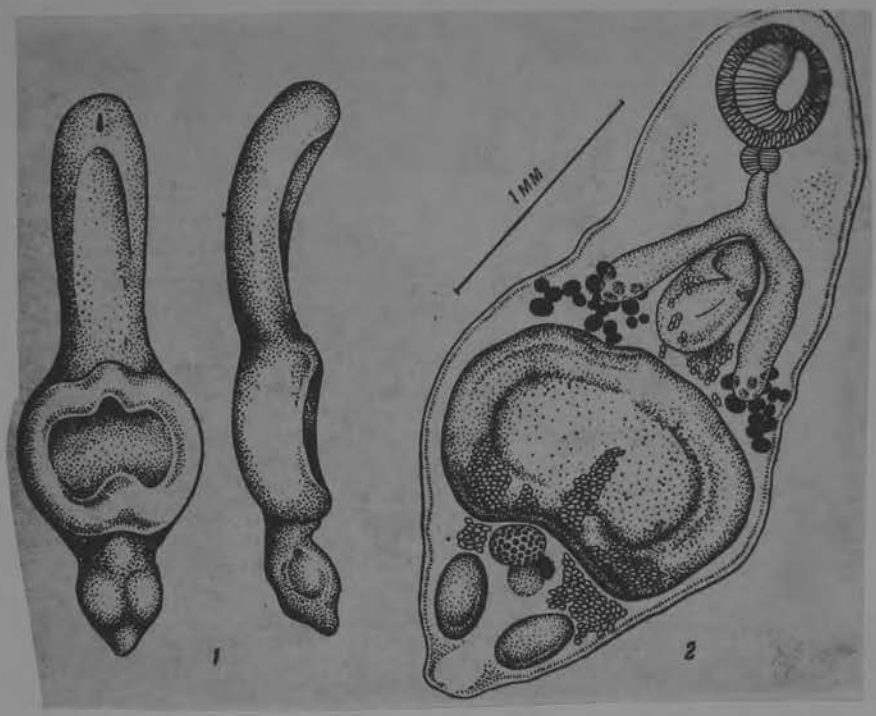


Remarks

Yamaguti (1938, 1942) described two species under the same name—*Paradiscogaster chaetodontis*. The two are, no doubt, distinct from each other and, therefore, the junior homonym, *P. chaetodontis* Yamaguti, 1942, is renamed as *P. yamagutii* nom. n.

Now *Paradiscogaster* Yamaguti, 1934, has three species: *P. pyriformis* Yamaguti, 1934, *P. chaetodontis* Yamaguti, 1938, and *P. yamagutii*. *P. farooqii* differs from all of them in the nature, sparse distribution, and extent of vitellaria. The species is named after Mr. Hisam U. Farooqi.

Paradiscogaster manteri Kurochkin, 1970



SEE REPRINT FOR DESCRIPTION

Paradiscogaster

Parantorchis Yamaguti, 1934

syn. of *Antorchis* Linton, 1911

Parantorchis

Phyllotrematinae ~~n. subf.~~ H. R. MEHRA, 1966

Subfamily diagnosis : Allocreadiidae : Body foliate, broadened posteriorly, broadest near posterior end, unspinulate. Cuticle smooth. Subcuticular musculature fairly well developed Oral sucker subterminal. Acetabulum larger than oral sucker, pre equatorial. Prepharynx distinct; pharynx rounded ; oesophagus moderately long, caeca terminating a little in front of posterior extremity. Genital pore slightly dextral, at level of intestinal bifurcation. Testes symmetrical, medial to caeca, immediately postequatorial. Cirrus sac elongate, claviform, extending slightly behind anterior border of acetabulum, enclosing vesicula seminalis, indistinct para prostatica and cirrus. Ovary slightly sinistral, equatorial between acetabulum and testes. Receptaculum seminis present. Uterus large, much coiled, mostly post-testicular, extending between testes to more than half of post-testicular region; metraterm present. Vitellaria lateral, of small grape-like bunches of follicles, extending from intestiral bifurcation to posterior extremity passing mesially near posterior end on either side of excretory vesicle behind and along posterior end of caeca and behind uterus. Excretory vesicle tubular, bifurcating into lateral horns immediately behind ovary. Parasitic in intestine of marine fishes.

Type genus : *Phyllotrema* Yamaguti, 1934 with *P. bicaudatum* Yamaguti, 1934 as the genotype.

Yamaguti (1934) thinks that *Phyllotrema* shows affinities with both the families Allocreadiidae and Fellodistomidae. This genus in our opinion stands intermediate between Plagioporinae of Opecoelidae and Allocreadiidae.

Phyllotrema Yamaguti, 1934

Generic diagnosis. — Allocreadiidae, Allocreadiinae: Body foliate, broadened posteriorly, unarmed. Acetabulum well developed, pre-equatorial. Oral sucker subterminal, prepharynx present. Esophagus of moderate length, ceca terminating near posterior extremity. Testes symmetrical, medial to ceca, postequatorial. Cirrus pouch pre-acetabular

for most part, containing winding seminal vesicle, indistinct prostatic complex and protrusible cirrus. No vesicula seminalis externa. Genital pore out of median line at about level of intestinal bifurcation. Ovary to one side of median line between acetabulum and testes. Receptaculum seminis present. Uterus passing between testes and occupying most of posttesticular intercecal field. Vitellaria extending in lateral fields from level of intestinal bifurcation to posterior extremity, forming bunch-like groups of follicles. Excretory vesicle simple, tubular, bifurcating into lateral horns immediately behind ovary. Parasitic in intestine of marine fishes.

Genotype: *P. bicaudatum* Yamaguti, 1934 (Pl. 10, Fig. 125) in *Ophichthys asakusae;* Seto Marine Biol. Stat., Wakayama Prefecture, Japan.

PHYLLOTREMA Yamaguti, 1934

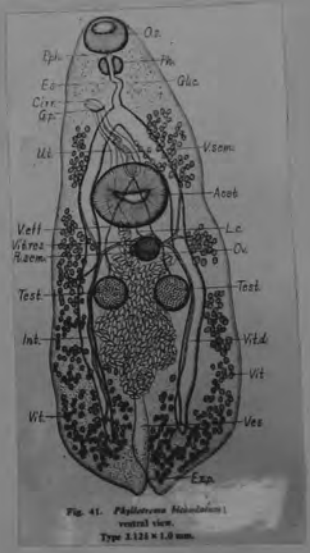
Phyllotrema n. g.

GENERIC DIAGNOSIS. Allocreadiidae Stoss., 1903. Body flat, foliate, broadest near posterior end. Cuticle smooth. Subcuticular musculature fairly well developed. Oral sucker subterminal. Prepharynx present. Pharynx globular. Esophagus moderately long. Ceca simple, terminating near posterior end of body. Acetabulum larger than oral sucker, about one third of body length from anterior end or a little more behind. Testes symmetrical, inside ceca, postequatorial. Cirrus pouch extending a little farther backwards than anterior border of acetabulum, enclosing well developed vesicula seminalis. Pars prostatica indistinct. Cirrus opening with metraterm a little to right at about level of intestinal bifurcation. Ovary only slightly to left, between acetabulum and testes. Receptaculum seminis present. Laurer's canal? Vitellaria follicular, lateral, extending from level of cecal bifurcation to posterior end of body. Vitelline reservoir dorsal to ovary. Uterus extending between testes as far backwards as middle of posttesticular region. Eggs elliptical, not very numerous. Excretory vesicle simple, tubular, bifurcating into lateral horns immediately behind ovary. Parasitic in marine fishes.

Genotype. *Phyllotrema bicaudatum.*

Phyllotrema bicaudatum Yamaguti, 1934. Two specimens from small intestine of Ophichthus asakusae Jordan & Snyder
Type: 3.125 by 1. Cuticle smooth.
Oral sucker 0.22 by 0.26. Pharynx 0.13 by 0.16
Acetabulum about 0.4, about 1/3 from anterior end.
Small seminal receptacle. Laurer's canal present.
Metraterm distinct. Eggs 90 to 96 by 40 to 48 μ
Wide simple excretory vesicle extending to ovary to bifurcate into lateral horns.

DISCUSSION. This species cannot be assigned to any known genus of Allocreadiidae or Fellodistomidae, although it bears a certain affinity to both families. From the disposition of the testes, ovary and uterus it is apparently of fellodistomid type, but the characters of the cirrus pouch, vitellaria and excretory vesicle prevent it from being placed in Fellodistomidae. Notwithstanding this inconsistency, I prefer to assign my species to Allocreadiidae. Whether it represents a distinct subfamily or should be included in Plesiocreadiinae Winfield, 1929, I cannot determine at present.



Fellodistomatidae

Daxiong, Jianying and Guoliang, 1979

PHYLLOTREMA MICRORCHIS sp. nov.

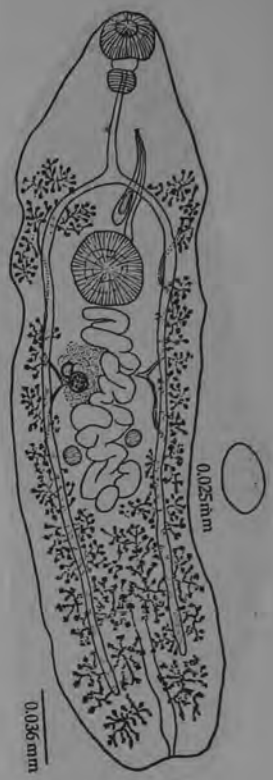
Fluke of medium size with anterior end slightly pointed and posterior end truncate but concave in the middle. Body smooth, 8.4—9.8 × 2.2—2.3 mm. Oral sucker 0.57—0.58 × 0.67—0.68 mm. Acetabulum situated at the anterior third of body, 0.92—0.94 × 0.86—0.93 mm. Prepharynx observed in one of the two specimens, 0.12 mm. Pharynx 0.27—0.29 × 0.38—0.40 mm. Oesophagus 0.71—1.08 mm. Intestinal crura ending in front of the last group of vitelline glands, not reaching posterior end.

Testes very small, oval, parallel, in middle of body, 0.21—0.25 × 0.21—0.29 mm. Cirrus sac claviform, with its posterior end not reaching acetabulum. Seminal vesicle sac-like. Genital atrium at level of middle and to right of oesophagus.

Ovary oval or round, about the size of testes, 0.23—0.24 × 0.29 mm situated about midway between acetabulum and left testis. Seminal receptacle lateral, close to and in front of ovary. Mehlis' gland well developed. Vitelline glands with follicles in groups of branches, distributed from anterior to intestinal bifurcation to posterior end of body and overlapping crura. Vitelline ducts at level of ovary. Uterine coils few, behind acetabulum and extending posterior to testes, occupying only about one third of the body length. Metraterm with eggs, running from anterior of acetabulum along cirrus sac to genital atrium. Eggs oval, 0.052—0.060 × 0.030—0.036 mm.

Excretory bladder long, tubular, reaching to level of testes. Parasitic in digest tract of *Ophichthys* sp., Huian County, Fujian Province, August 1964.

The genus Phyllotrema was established in 1934 by Yamaguti with *P. bicaudatum* as the type which remains unique in the genus. *P. microrchis* sp. nov. may be distinguished from the type species by (1) the larger size of the body and the smaller size of the eggs, (2) the presence of about one third of the total uterine loops between acetabulum and ovary and the uterus not extending as far behind the testes as that of the type species, (3) the cirrus sac being shorter, with its proximal end not overlapping acetabulum, (4) the testes being very small as comparing with the larger size of the worm. hence the name *Phyllotrema microrchis* sp. nov.



两种叶孔吸虫量度的比较(单位：毫米)

	P. bicaudatum(模式种依山口)	*P. microrchis* (新种)
体　长	3.125	8.4—9.8
体　宽	1.0	2.208—2.34
口吸盘	0.22×0.26	0.57—0.58×0.67—0.68
腹吸盘	0.4 (直径)	0.92—0.94×0.86—0.93
前　咽		0.12
咽	0.13×0.16	0.27—0.29×0.38—0.40
食道长	0.22	0.71—1.08
睾　丸	0.2—0.21×0.19—0.2	0.21—0.25×0.21—0.29
卵　巢	0.13	0.023—0.024×0.029
卵	0.09—0.096×0.04—0.048	0.052—0.060×0.030—0.036
睾丸长度：体长	1:15.6	1:40—46.6

1. 虫体绝大部分结构的量度均大于模式种；但卵则小于模式种甚多；

2. 本种的子宫约有 1/3 在腹吸盘之后，卵巢之前，延伸到睾丸后的并不多。卵黄腺在子宫之后的肠支内侧甚为发达；

3. 阴茎囊较短，不达腹吸盘前缘。

4. 本种的睾丸与体长相比甚为细小，因此将本种订名为小睾叶孔吸虫（新种）*Phyllotrema microrchis* sp. nov.

模式标本存贵阳医学院寄生虫学教研组。

~~LEPOCREADIIDAE~~
Fellodistomidae

GU CHANG-DONG AND SHEN-JI-WEI, 1979

(4) *Phyllotrema quadricaudatum*, ~~sp. nov.~~ (fig. 4)

Twelve specimens were discovered from the intestine of one out of five *Muraenesox cinereus* (Forskål) from Haikou, Hainan Island, Guangdong Province, on May 8, 1958.

This species differs from *Phyllotrema bicaudatum* Yamaguti, 1934 not only in the number of caudal lobes, but also in the shape of testes and ovary, in the distribution of vitellaria, in the posterior limit of uterine loops, and in the smaller eggs.

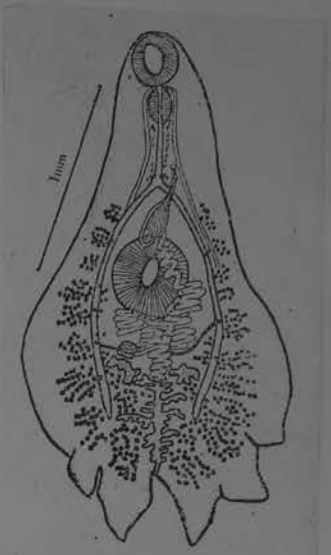


图 4 四尾叶形吸虫 *Phyllotrema quadricaudatum*, 新种的整体背面

Phyllotrema

Piriforminae n. subfam.

Subfamily diagnosis. — Fellodistomidae: Body pyriform, unarmed. Ceca united posteriorly. Acetabulum large, with anterior and posterior lips of lamellar muscles, postequatorial. Testes diagonal, at posterior extremity. Ovary immediately anterolateral to posterior testis. Vitellaria forming bunches of follicles in lateral fields of ~~hind~~fore body. Uterus occupying most of cecal zone, not extending backward over testes. Excretory vesicle V-shaped.

Piriforma Yamaguti, 1938

Generic diagnosis. — Fellodistomidae, Piriforminae: Body pyriform, unarmed. Oral sucker subterminal; pharynx small; esophagus short; ceca united posteriorly. Acetabulum large, postequatorial, provided with two lips of lamellar muscles. Testes contiguous with each other, at posterior extremity. Cirrus pouch pre-acetabular, containing bipartite seminal vesicle and well developed prostatic complex. Genital pore pre-acetabular, submedian. Ovary lobed, anterolateral to posterior testis. No receptaculum seminis. Uterus occupying most of body except two extremities. Vitellaria forming bunches of follicles in lateral fields of forebody. Excretory vesicle V-shaped. Parasites of marine fishes.

Genotype: *P. macrorhamphosi* Yamaguti, 1938 (Pl. 3, Fig. 29), in *Macrorhamphosus japonicus;* Maisaka and Koti, Japan.

Fellodistomidae

Piriforma macrorhamphosi Yamaguti, 1938

Length: 1.2-2.4 mm.
Width : 0.58-1.3 mm. at level of acetabulum.
Oral sucker: 0.5-0.24 X 0.15-0.31 mm.
Acetabulum (size): 0.25-0.68 X 0.28-0.78 mm.
(location) :Its center is behind the middle of the body.

Esophagus: Short, only 90 u long in the largest type.

Pharynx: 50-90 X 70-140 u, less muscular than oral sucker.

Genital pore: To the left of the median line a little in front of the acetabulum.
Testes (shape): Globular to oval.
(location) : Obliquely side by side at posterior extremity; the left usually in front.
Cirrus sac: Extends to right of median line & to midbody level.
Ovary (shape): Divided into three subglobular lobes.
(location): Anterodextral to right testis.

Vitellaria: Consists of bunches of follicles extending along outer side of intestine from pharynx level to middle of acetabulum.
Eggs: Elongate oval, light brown, thick-shelled, 33-38 X 18-24 u.
Other features: Eggs have punctum at broader antiopercular pole.

Host: Macrorhamphosis japonicus (Gunther)

Locality: Maisaka, Japan and Koti, Japan.
Comparisons: Rhodotrema Odhner, 1911

Reference: Yamaguti, S. Studies on the helminth fauna of Japan Part 21. Trematodes of fishes, IV. Kyoto, Japan, 1938
Life cycle:

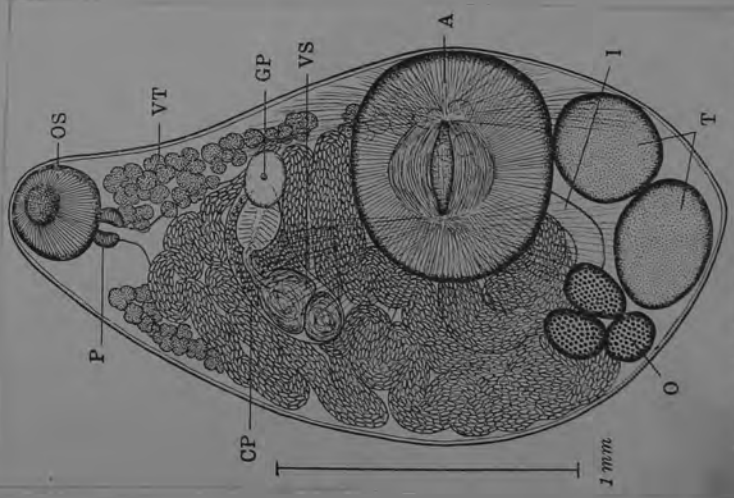


Fig. 58. *Piriforma macrorhamphosi*; ventral view.

Piriforma

Proctoeces Odhner, 1911

Syn. *Xenopera* Nicoll, 1915 [1])

Generic diagnosis. — Fellodistomidae, Heterorchiinae: Body elongate. Oral sucker and pharynx well developed. Esophagus short; ceca reaching to posterior extremity. Acetabulum on short pedicle, in anterior half of body. Testes oblique, toward middle of hindbody. Cirrus pouch reaching back of acetabulum, containing winding tubular seminal vesicle and long prostatic complex. Cirrus projecting into tubular genital sinus (hermaphroditic duct). Genital pore submedian or median, pre-acetabular. Ovary pretesticular. No receptaculum seminis. Vitelline follicles in ovariotesticular zone. Uterus filling up all available space of hindbody. Excretory vesicle Y-shaped. Parasites of marine fishes. Metacercaria in marine mollusca.

Genotype: *P. maculatus* (Looss, 1901) Odhner, 1911 (Pl. 2, Fig. 17), in *Labrus merula*, *Crenilabrus pavo*, *C. griseus*, *Blennius ocellaris*; Mediterranean, Black Sea, also in *Sparus macrocephalus*, *Sparus aries*, *Pagrosomus auratus*, *Epinephelus akaara*, *Semicossyphus reticulatus* from Inland Sea, Japan, and *Duymaria flagellifera* from Hamazima, Japan.

Other species

P. erythraeus Odhner, 1911, syn. of *P. subtenuis* — Hanson, 1950, in *Chrysophrys bitaeniata*, *Julis lunaris*, Red Sea.
Also in *Calamus bajonado* and *Calamus calamus*, Florida.

P. insolitus (Nicoll, 1915) (syn. *Xenopera i. N.*) in *Sparus australis*; N. Queensland.

P. macrovitellus Winter, 1954, in *Cymatogaster aggregata*; California.

P. magnorus Manter, 1940, in *Caulolatilus anomalus*, Cerros Island, Mexico.

[1]) That the greater part of the seminal vesicle lies outside the cirrus pouch in *Xenopera insolita* Nicoll, 1915, requires confirmation by examination of the original specimens.

P. major Yamaguti, 1934, in *Pagrosomus auratus*; Tarumi, Japan.

P. ostreae Fujita in Dollfus, 1925, metacercaria in gonad of *Ostrea gigas*; Japan.

P. subtenuis (Linton, 1907) (syn. *Distomum subtenue* L.) in *Calamus calamus*; Bermuda, New Zealand, Red Sea.

P. larva (Yamaguti, 1938) in liver of *Brachiodontes senhausi*; Tarumi, Japan.

Genus ***PROCTOECES*** Odhner, 1911

DIAGNOSTIC FEATURES. External seminal vesicle absent. Vasa efferentia unite at, or close to, base of cirrus-sac.

TYPE-SPECIES. *Proctoeces maculatus* (Looss, 1901) (by subsequent designation: Fujita, 1925 : 56).

COMMENT. Fourteen species have been assigned to this genus, seven of which we believe to be synonymous with the type-species. We consider the status of the others as follows:

(1) *Proctoeces insolitus* (Nicoll, 1915) Yamaguti, 1953; the type-species of the genus *Xenopera* Nicoll, 1915 (see above).

(2) *P. lintoni* Siddiqi & Cable, 1960; from sparid and labrid fishes in and around the Caribbean Sea. This species differs from *P. maculatus* in having a globular posterior portion in addition to the convoluted, tubular part of the seminal vesicle.

(3) *P. macrovitellus* Winter, 1954; it was pointed out by Freeman & Llewellyn (1958) that this was not a *Proctoeces*, and Winter later (1960) transferred it to the zoogonid genus *Diplangus* Linton, 1910.

(4) *P. magnorus* Manter, 1940; from *Caulolatilus anomalus* off the Pacific Coast of Mexico. This species is known only from a single specimen in which the oral sucker is larger than the slightly pedunculate ventral sucker. In addition to these features, it differs from *P. maculatus* in apparently possessing a smaller average egg-size (32–37 × 15–19 μm). Nevertheless, Freeman & Llewellyn (1958) considered it to be a synonym of *P. subtenuis* (Linton, 1907) [= *P. maculatus*]. In view of the differences listed above and until more material has been examined from the type-host and locality, we prefer to consider this species a *species inquirendum*.

(5) *P. neomagnorus* Siddiqi & Cable, 1960; this is considered a synonym of *Mesolecitha linearis* Linton, 1910, by Nahhas & Cable (1964).

(6) *P. ostreae* Fujita, 1925; described as a metacercaria which may be progenetic from the gonads of the bivalve *Crassostrea gigas* off Japan. It is said to occur as an adult in *Pagrosomus major* and *Epinephelus akaara* (Korringa, 1952), but Komiya (1965) believed that the final host was still unknown. Dollfus (see above) considered that it was possibly the metacercaria of *Xenopera insolita*.

FROM BRAY AND GIBSON, 1980

Proctoeces species:

P.maculatus (Loss,1901) Odhner,1911

Host: Labrus merula at Trieste
Crenilabrus pavo Med.

Blennius ocellaris blenny - Europe.

Sparus macrocephalus Japan
Sparus aries "
Pagrosomus auratus "
Epinephelus akaara "
Semicossyphus reticulatus "

Dysmaeria flagellifera Japan.

P.erythraeus Odhner,1911

Host: Chrysophrys bifasciata Red Sea
Iulis lunaris -immature

Crenilabrus Black Sea

synonym.

P.subtenue (Linton,1907) Hanson,1950

Hosts: Calamus calamus Bermuda
Tortugas
Calamus bajonado Tortugas
Latridopsis ciliaris New Zealand

P.major Yamaguti,1934
Host: Pagrosomus auratus Japan

P.magnorus Manter,1940
Host: Caulolatilus anomalus Mexican Pacific

P.ostreae Fujita,1925

Host: for metacercariae :Ostrea gigas Japan

~~P. sp.~~

~~Host~~:

See Freeman, R.F.H. & Llewellyn, J. 1958.
J. Mar. Biol. Ass. U.K. 37: 435-457.

Proctoeces subtenuis (Linton) was reported as progenetic adults in the kidneys of a lamellibranch, Scrobicularia plana (Da Costa) in England, by Freeman & Llewellyn (1958.)

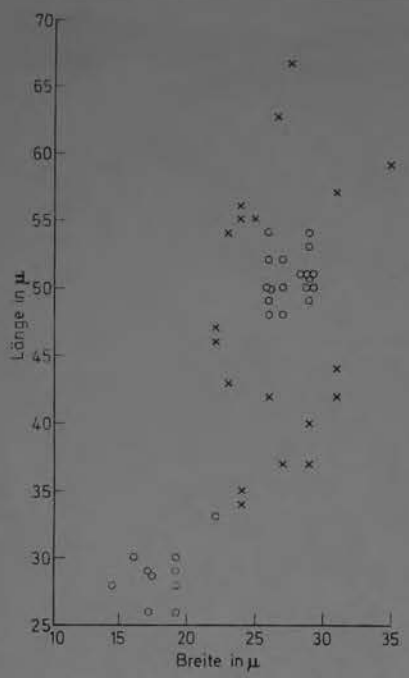


Abb. 4. Graphische Darstellung der Eigrößen, ○ *P. buccini*, × *P. scrobicularíae*

1. *P. maculatus* (Looss, 1901) aus *Labriden*: Bauchsaugnapf etwas weiter hinten. Verhältnis von größter Körperlänge zur größten Bauchsaugnapflänge (nicht Breite!) nach Odhner (1911) 3,6 : 1; bei *P. buccini* 7,7 : 1. Eier mit 70 × 26 µ größer als bei *P. buccini*.

2. *P. subtenuis* (Linton, 1907) aus *Spariden*: Mundsaugnapf breiter als lang, Pharynx mit 150 µ und Bauchsaugnapf mit 300 × 480 µ bei gleicher Körperlänge kleiner als bei *P. buccini*. Eier viel schmaler als bei diesem. Körperform sehr ähnlich.

3. *P. erythraeus* Odhner, 1911 aus *Spariden*: Bauchsaugnapf mit 380 × 400 µ kleiner. Eier kleiner bzw. größer als bei *P. buccini*.

4. *P. insolitus* (Nicoll, 1915) aus *Spariden*: Mundsaugnapf länglich, Bauchsaugnapf mit 280 × 390 µ kleiner, Pharynx mit 140 µ Breite schmaler als bei *P. buccini*. Darmschenkel reichen bis Körperhinterende, Cirrusbeutel viel weiter nach hinten als bei *P. buccini*.

5. *P. ostreae* Fujita, 1925 aus *Ostrea gigas*: Mit 0,97 mm viel breiterer Hinterkörper, dazu weiter nach hinten reichende und mit 200 µ breitere Darmschenkel als *P. buccini*. Eier mit 40 × 20 µ schmaler als bei diesem.

6. *P. major* Yamaguti, 1934 aus *Spariden*: Längen—Breiten-Verhältnis des Körpers größer, sonst aber Gestalt wie *P. buccini*. Mundsaugnapf breiter als lang. Ovar dreilappig oder dreieckig. Uteruswindungen bis nahe Bauchsaugnapf.

7. *P. magnorum* Manter, 1940 aus *Branchiostegiden* (Literatur in Deutschland nicht erhältlich).

From [redacted] Looss - Frank, 1969

Fellodistomidae
Haplocladinae

PROCTOECES Odhner, 1911

Body elongate, equally wide in hindbody, rather flattened, unspined. Suckers strong, near each other; ventral sucker larger, strongly protruding. Short prepharynx, large pharynx, esophagus shorter than pharynx. Ceca reaching to hind end. Excretory vesicle Y-shaped, the forking occurring between the testes, the branches reaching to the pharynx. Genital pore a little to the left, not far in front of the ventral sucker. Genital sinus very wide. Cirrus sac elongate at dorsal edge of ventral sucker, parallel with long axis of body. It contains a rather long cylindrical, thick-walled pars prostatica. In its posterior half a thin, tube-like, much coiled seminal vesicle. On each side of the often strongly nipple-like opening of the pars prostatica occurm in the genital sinus, small muscular, lip-like structures. (According to Odhner, in Looss' figure the cirrus sac is too far posterior because of pinching). Testes round, entire, slightly oblique, in or about the middle of the body. Ovary round, pretesticular, at hind edge of ventral sucker. No seminal receptacle. Laurer's canal present. Vitellaria weakly developed, with sparse follicles at level of ovary and testes. Uterus completely filling hind body. Eggs very elongate, yellow, containing ciliated larvae. Type species: P. maculatus (Looss, 1901) from Labrus merula at Trieste

P. maculatus (Looss) : Length 2.5 to 3.2 but mature at 1. hindbody 0.5 to 0.7 wide. Oral sucker 0.2 to 0.3; pharynx 0.15 to 0.23; ventral sucker 0.4 to 0.7 by 0.28 to 0.42. Eggs (living) 72 to 79 by 27 µ. Vitellaria slightly overreaching the hind testis. Hosts: Labrus merula; Crenilabrus pavo.

Mediterranean

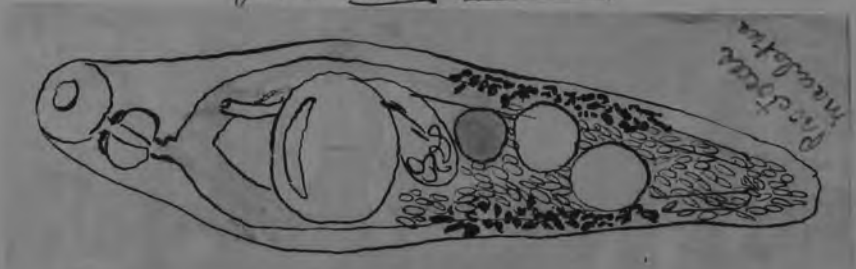
1934
Yamaguti records this species from:
Sparus macrocephalus
Sparus aries
Pagrosomus auratus
Epinephelus akaara

Yamaguti 1937 from: Semicossyphus reticulatus (Cuv. & Val.)

0.27 to 0.57

P. erythraeus Odhner : Ventral sucker at least 1/3 smaller than in the above species. Eggs about 45 µ long. Vitellaria shorter. From the Red Sea.
1 mature specimen from Chrysophrys bifasciata, 2 immature specimens from Julis lunaris

Red Sea



(over)

Рис. 6. *Proctoeces maculatus*

From Wlassenko, 1931
from Crenilabrus; Black Sea.

Proctoeces maculatus (Lss.)

(Looss, 1901, Fig. 3.)

Länge bis 2,5, nach Looss bis 3,2 mm; schon 1 mm lange Exemplare sind aber von Eiern stark gefüllt. Breite im Hinterkörper 0,5 bis 0,7 mm. Dicke 0,3—0,45 mm. Mundsaugnapf 0,2—0,3, Pharynx 0,15 bis 0,23 und Bauchsaugnapf 0,42—0,7 × 0,28—0,42 mm im Durchmesser; letzterer auf der Grenze zwischen erstem und zweitem Körperdrittel. Eier, in vivo gemessen, 0,072—0,079 mm lang bei einer Dicke von etwa 0,027 mm. Dotterstöcke nach hinten zu den hinteren Hoden leicht überragend.

In mehreren Labriden der Adria (Triest, Looss, ipse leg.); außerdem habe ich in Neapel ein Exemplar in *Blennius ocellaris* gefunden.

Ich kann die Vermutung nicht unterdrücken, daß die von J. Müller bei Triest gefischte freischwimmende *Cerc. setifera* [16], wovon La Valette (1855, Tab. II, Fig. II) eine Abbildung ohne Beschreibung veröffentlicht hat, auf *Pr. maculatus* zu beziehen ist. Ich wüßte wenigstens kein zweites »Distomum« aus Mittelmeerfischen, das einen so großen Pharynx mit mangelndem (oder ganz kurzen!) Oesophagus und Präpharynx ebenso wie mit das Hinterende erreichenden Darmschenkeln vereinigt. Daß die Saugnäpfe bei der Cercarie ziemlich gleichgroß sein sollen, braucht nicht gegen meine Annahme zu sprechen, da ihre relativen Größen sich ja oft beim späteren Wachstum bedeutend verschieben.

From Odhner -1911

From Manter & Pritchard (1962):

Proctoeces maculatus (Looss, 1901) Odhner, 1911
(Syn. *P. erythraeus* Odhner, 1911 and *P. subtenuis*
(Linton, 1907) Hanson, 1950)
(Fig. 2)

Host: *Thalassoma duperreyi* (Quoy and Gaimard), hinalea lauwili or 'a'ala'ihi (Labridae, wrasses); four specimens from two of 49 fishes.

Location: Intestine.

Specimen deposited: U. S. Nat. Mus. Helminth. Coll., No. 39459.

Discussion: Freeman and Llewellyn (1958) reported progenetic trematodes in the kidneys of a lamellibranch, *Scrobicularia plana*, inhabiting the Thames estuary, and concluded that at least in this locality, no fish hosts were involved. They identified these trematodes as *Proctoeces subtenuis* (Linton, 1907) (syn. *P. erythraeus* Odhner, 1911), but suggested more knowledge of intraspecific variation might lead to the synonymy of *P. subtenuis* with *P. maculatus* (Looss, 1901).

Stunkard and Uzman (1959) reported *Protoeces maculatus* progenetic in the gonads of mussels, *Mytilus edulis*, collected at Woods Hole (Massachusetts), in Long Island Sound, and along the coast of Connecticut. They believed these trematodes to be the same species named *Distomum subtenue* by Linton, and that *P. subtenuis* is a synonym of *P. maculatus*.

P. subtenuis (syn. *P. erythraeus*) has been distinguished from *P. maculatus* on the basis of smaller sucker ratio, less extensive vitelline glands, and smaller eggs. The importance of sucker ratio and vitelline extent has decreased as *P. subtenuis* has been reported from various localities, but the smaller eggs seemed a constant difference. Freeman and Llewellyn found three of 100 eggs to be longer than 52 microns (up to 73 microns) but considered them as abnormal, as some very small eggs (26 microns) were also abnormal. We had available one specimen identified by Yamaguti as *P. maculatus* from *Sparus macrocephalus* from the Inland Sea of Japan. Fifty eggs were measured; most were 64 to 67 by 21 to 24; but 11 eggs were less than 60 microns long and five were over 67 microns long; the range (48 to 75 by 18 to 29) completely overlapped the ranges for *P. maculatus* and *P. subtenuis*. The eggs are thin-shelled and may vary according to physiological conditions and methods of fixation.

In view of the variation of egg-size within a single specimen, it seems necessary to accept the synonymy of *P. subtenuis* with *P. maculatus*. *P. maculatus* is, then, world-wide and occurs in many different fish hosts, though usually in small numbers. As suggested by Stunkard and Uzman, the variety of hosts is not necessarily significant because the worms are progenetic and could be taken from the digestive tract of any fish which had recently ingested the molluscan host. *P. maculatus* is one of two species of Digenea occurring in both the Mediterranean and the Red Sea. It is now evident that this species has a more or less continuous means of dispersal between these seas by oceanic pathways.

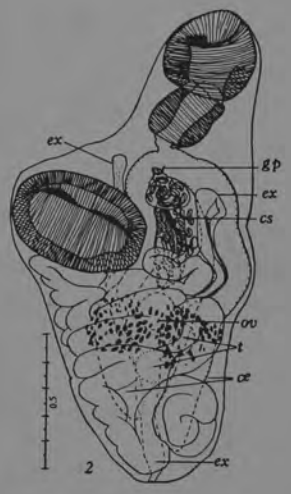
We have examined specimens from Bermuda, Tortugas, Hawaii, New Zealand, and Japan. In all but one of these specimens the cirrus sac extended posterior to the acetabulum. The extent of this structure was not clearly indicated by Stunkard and Uzman; and Freeman and Llewellyn reported that although considerable variation was possible, normally the cirrus sac overlapped the acetabulum both anteriorly and posteriorly. The same condition is probably true of all species of *Proctoeces* described to date.

P. magnorus Manter, 1940, was considered a synonym of *P. subtenuis* by Freeman and Llewellyn, but we believe the large oral sucker and a sucker ratio of less than 1:1 distinctive. *P. neomagnorus* Siddiqi and Cable, 1960 has a similar sucker ratio. These authors also named *P. lintoni* characterized by a bipartite seminal vesicle.

Xenopera Nicoll, 1915 was considered a synonym of *Proctoeces* by Dollfus (1952) and by Yamaguti (1954, 1958). Freeman and Llewellyn even questioned the validity of the species *P. insolitus* (Nicoll, 1915) (=*X. insolita*) from Australia. It differs from *P. maculatus* only in having an external seminal vesicle. Yamaguti doubted the presence of this external seminal vesicle and suggested the character needed confirmation. One of us (Manter) collected a fellodistomid in New Zealand that belongs to the genus *Xenopera* (Fig. 3), although agreeing with *Proctoeces* in other respects, a part of the seminal vesicle (Fig. 4) is, indeed, outside the cirrus sac. This species was omitted from Manter's New Zealand paper (1954) because it is a single specimen for which the host record is uncertain. It does not seem to be *X. insolita*; it is mentioned here only to verify the genus *Xenopera*.

Fig. 3. *Distomum maculatum* n. sp., von der Bauchseite. Vergr. ca. 43.

FROM LOOSS, 1901. SEE REPRINT.



Proctoeces maculatus (Looss, 1901) Odhner, 1911

Synonyms: Distomum subtenue Linton, 1907; *Proctoeces subtenuis* (Linton) Hanson, 1950; *Proctoeces erythraeus* Odhner, 1911.

Host: **Lactophrys tricornis* (J).

Site: intestine.

Heretofore, this trematode has been reported from species of *Calamus*. Our single specimen from a trunkfish may represent an accidental infection.

JAMAICA; Fish Nahhas + Cable 1964

Proctoeces maculatus (Looss, 1901) Odhner, 1911
Distomum maculatum Looss, 1901.
Distomum subtenue Linton, 1907.
Proctoeces erythraeus Odhner, 1911.
Proctoeces subtenuis (Linton, 1907) Hanson, 1950.

Host: *Calamus bajonado* (1 of 1).
Site: Rectum.
Discussion: In view of the variation in specimens from various parts of the world, it seems pertinent to give a few characteristics of my four specimens. They are 1.7 to 2.2 long with sucker ratios of 1:1.5 to 1.8 and eggs 45 to 62 by 19 to 24 microns. They have a long genital sinus and vitellaria extending to a level posterior to the testes. Manter and Pritchard (1962:115-116) gave a review of the species. Overstreet 1969

Other helminth parasites

(1) *Metacercariae of* Proctoeces maculatus (*Looss*, 1901) *Odhner*, 1911 (*Trematoda*: *Fellodistomidae*)

Unencysted metacercariae were found in the gonads of *A. crassispina* (two specimens, NSMT–Pl 2640), *D. setosum* (two specimens, NSMT–Pl 2641) and *H. pulcherrimus* (one specimen, NSMT–Pl 2642). The incidence of infection of each of these sea urchins was not recorded. The morphology and measurements of the five metacercariae were: body immature, 1.80–4.20 long by 0.44–1.00 wide; oral sucker 0.26–0.56 long by 0.26–0.54 wide; pharynx 0.16–0.32 long by 0.12–0.34 wide; ventral sucker 0.36–0.76 long by 0.40–0.86 wide; sucker width ratio 1: 1.40–1.81; testes 0.10–0.44 in diameter; cirrus pouch 0.28–1.00 long; ovary rounded or trilobed, 0.06–0.30 in diameter.

From SHINAZU AND SHIMURA, 1984

Proctoeces maculatus (Looss, 1901) Odhner, 1911

Distomum maculatum Looss, 1901.
Distomum subtenue Linton, 1907.
Proctoeces subtenuis (Linton) Hanson, 1950.
Proctoeces erythraeus Odhner, 1911.
(?) *Proctoeces major* Yamaguti, 1934.
(?) *Cercaria tenuans* Cole, 1935.
Cercaria milfordensis Uzman, 1953.
Proctoeces progeneticus Dollfus, 1965.
Proctoeces sp. of Ichihara (1964, 1965).
Proctoeces buccini Loos-Frank, 1969.
Proctoeces scrobiculariae Loos-Frank, 1969.
Proctoeces hawaiiensis Yamaguti, 1970.

TYPE-HOST AND LOCALITY. *Labrus merula*, Trieste, Adriatic Sea.

RECORDS. All records from the NE Atlantic are from molluscs.
(i) Material studied
(a) From the NE Atlantic
Buccinum undatum [kidney] Solent, Hampshire, England. Material of F. R. Stranack.
Nucella lapillus [?] Dawlish, Devon, England (Sept., 1978). BM(NH) 1978.10.2.1.
Scrobicularia plana [kidney] Chalkwell, Essex, England. Material of J. Llewellyn.

(b) From elsewhere
Halichaeres bivittata [intestine] Bermuda (see Rees, 1970 : 205; as *Proctoeces subtenuis*). BM(NH) 1976.4.8.174.

(ii) NE Atlantic records from the literature
Buccinum undatum [kidney] Mellum Island, North Sea. Loos-Frank (1969 : 326; as *Proctoeces buccini*).
(?) —— [?] Scotland. Wootten, in White (1972 : 458; as *Proctoeces* sp.).
Scrobicularia plana [kidney] Chalkwell, Essex, England. Freeman & Llewellyn (1958 : 435; as *Proctoeces subtenuis*); Freeman (1962 : 199; 1963*a* : 113; 1963*b* : 253; as *P. subtenuis*); White (1972 : 458; as *P. subtenuis*).
—— [kidney] Whitstable, Kent, England. Freeman & Llewellyn (1958 : 435; as *Proctoeces subtenuis*).
—— [kidney] Dawlish Warren, Exe estuary, Devon, England. White (1972 : 458; as *Proctoeces subtenuis*).
—— [kidney] Estuaries of Rivers Jade and Wesef, Langwarden, West Germany. Loos-Frank (1969 : 329; as *Proctoeces scrobicularíae*).
—— [?] Burry Inlet, South Wales. James *et al.* (1977 : 13; as *Proctoeces subtenuis*).

ASPECTS OF BIOLOGY. The life-history and biology of this worm have been the object of a number of studies, and an interesting picture has emerged. It is apparent that in the warmer waters of its range, this species occurs as an adult in fishes. These fishes are normally shallow-water forms, principally labrids and sparids. This part of its range includes the shallow-waters of the Mediterranean and Black Seas, the southern North Atlantic, the eastern South Atlantic, the Caribbean Sea, the Red Sea, New Zealand, Japanese and Hawaiian waters, the latter records indicating that it may occur widely in the shallow and warmer waters of the Pacific Ocean. There is a single report of *Proctoeces* in deep-water fishes by Kamegai (1974), who found them in *Peristedion orientale* and *Synchirops altivelis* off Japan. In the colder waters of its range in the northern hemisphere adults are found in molluscs. The degree to which the life-history is abbreviated varies. Sometimes the whole life-history apparently takes place in one host or, alternatively, adults sometimes occur in what appears to be a secondary molluscan host. Prevot (1965) and Lang & Dennis (1976), in pointing out that this so-called 'progenesis' appears to be more pronounced in temperate regions, have suggested that this may represent a mechanism to enable the species to extend into cooler waters without a dependence on its normal warm-water fish-hosts. Yet, it is apparent that several labrids and sparids are common around the British coast, and, although capable of being infested (Freeman, 1963*a*), there are no records in nature.

The daughter-sporocysts of this species have been found in the blood-vessels, blood-sinuses and digestive gland of *Mytilus* spp. Uzman (1953) described the cercariae shed by *Mytilus edulis* from the northeastern coast of the USA as *Cercaria milfordensis*, and simultaneously found

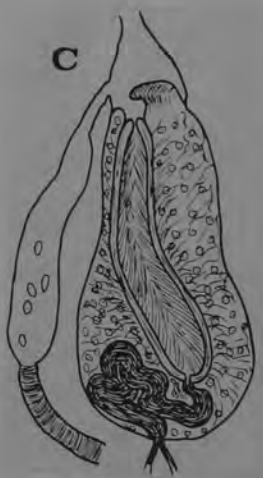


Fig. 16 *Proctoeces maculatus*: (a & b) flattened specimens – (a) ventral view of specimen from *Buccinum undatum*; (b) dorsal view of specimen from *Scrobicularia plana*; (c) cirrus-sac; (d) diagram of female proximal genitalia (modified after Freeman & Llewellyn, 1958). Bar scale: a, b = 1 mm.

–OVER–

Vigerous specimens of *Proctoeces* in the same host. Stunkard & Uzman (1959) found at least two sporocyst-generations, cercariae, metacercariae and ovigerous adults in this host, associating *Cercaria milfordensis* with *P. maculatus*, and postulated a telescoped or abbreviated life-history. The mother-sporocysts are globular and saccular, and each contain several daughter-sporocysts, which are simple, motile and orange. Evidently the sporocysts in the vascular system seriously reduce the efficiency of the circulatory system and destroy the gonads of the host, impair its vitality and are probably lethal. Dennis *et al.* (1974), however, found that the carbohydrate reserves and phosphatase activity of the mussel are not affected by the presence of *P. maculatus*. The cercaria is microcercous, but with a tendency to lose its tail, and possesses a 'Y'-shaped excretory vesicle. Although in some cases the entire life-history occurs in the one host, it is presumed that the mollusc is often ingested by a fish which becomes the final host. There may also be a transfer of cercariae from one mollusc to another. Lang & Dennis (1976) have summarized what is known of the seasonal incidence of *P. maculatus* in *Mytilus edulis* from the northeastern coast of the USA. Daughter-sporocysts evidently accumulate in the mussels and probably persist until the death of the host, whereas adult infestations in the kidney and pericardium of this host do not exhibit a cumulative pattern of intensity and apparently terminate annually with the death of the parasites.

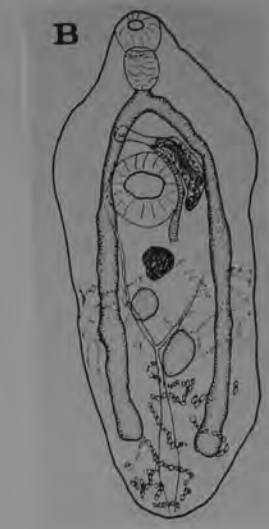
Prevot (1965) discovered sporocysts of this species in *Mytilus galloprovincialis* in the Mediterranean. The second intermediate hosts he found were the polychaetes *Nereis caudata* and *Hydroides norvegica* and the molluscs *Patella coerulea* and *Acanthochites discrepens*. He was unable to find complete progenesis in *M. galloprovincialis* or *N. caudata*, many examples of which he examined, although some specimens did contain anomalous eggs. On being transferred to various fishes with a pipette, the parasites survived without maturation in *Gobius niger* and *Coris julis*, but matured in the labrid *Symphodus cinereus* [=*Crenilabrus griseus*]. Dupouy & Martinez (1973) similarly found the sporocysts in *M. galloprovincialis* and metacercariae in the polychaete *Leptonereis glauca*, and they stated that *P. maculatus* only rarely or indirectly 'castrated' this mussel.

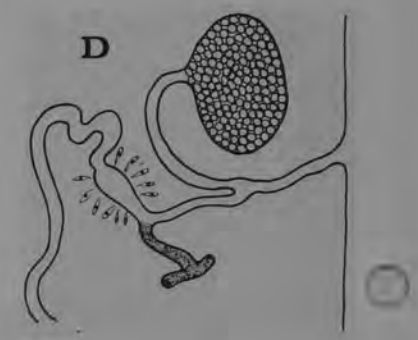
The first intermediate host in north-eastern Atlantic waters is not known, unless *Cercaria tenuans* Cole, 1935, is a synonym of *C. milfordensis* Uzman, 1953, as tentatively suggested by Canzonier (1972). *C. tenuans* has been found in *Mytilus edulis* from Conway, North Wales and Boston, Lincolnshire, England (Coles, 1935), Padstow, Devon, England (Atkins, 1931), Ria de Arosa, northwestern coast of Spain (Canzonier, 1972) and Ria de Aveiro, Portugal (Dias & Serrano, 1972).

In our region unencysted adult specimens of *P. maculatus* occur in the kidney of the bivalve *Scrobicularia plana*. Its biology in this host has been studied by Freeman & Llewellyn (1958), Freeman (1962, 1963*a*, 1963*b*) and White (1972) from which the following data are taken. At Chalkwell in the Thames estuary every specimen of this bivalve examined was infested, and the total number of *S. plana* in the region numbered several million. The distribution, however, is restricted. It has been reported from Dawlish, Devon; but all of the specimens which we have examined from this region were uninfested. At Whitstable on the opposite bank of the Thames estuary from Chalkwell only three of many *S. plana* were found to be infested. In the severe winter of 1962–63 *S. plana* was eliminated from the part of the Thames estuary where it has been infested with *P. maculatus;* but on its return a build up of infestation was observed. Little seasonal variation occurs in the Thames estuary. Other bivalves in the Thames (e.g. *Mya* and *Macoma*) were not found to harbour *P. maculatus*. In *S. plana* an increase in the intensity of the infestation, up to a maximum of 14 per host, was found to be related to the size of the host. Parasites of varying sizes were found in the same host, so it would appear that there is no intraspecific inhibition to secondary infestations. In addition, many dead and 'petrified' worms were found in the kidneys of *S. plana*.

The environment in *S. plana* is osmotically variable, as the osmolarity of the host's body-fluids tends to follow that of the estuary. In this respect, therefore, the environment is more like that of a free-living estuarine turbellarian than a normal adult digenean. The trematode is red or pink due to the presence of a haem pigment but when the worm is in fishes this pigment declines in intensity. The haemoglobin was thought to have a respiratory function only when the oxygen tension is lowered as the valves close. Freeman (1963*b*) estimated that this oxygen store could last 5 minutes but Lee & Smith (1965) have corrected this figure to 2·5 minutes.

It has been suggested that *Proctoeces* is a recent addition to the British fauna and does not occur regularly in fish in this area, thus possibly explaining its apparent disjunctive distribution. With regard to its absence from fish-hosts, it should be pointed out, however, that there appears to be no evidence that labrid fishes which occur in the region of known foci of this parasite in *S. plana* have actually been examined. The only common labrid in the Thames estuary is *Symphodus* [=*Crenilabrus*] *melops*, which, although unlikely to feed on *S. plana*, is known to feed on *Mytilus edulis*. Attempts to infest the two labrids available in sufficient numbers at Plymouth, *Ctenolabrus rupestris* and *Symphodus melops*, have been made. Kidneys of *S. plana* from Chalkwell, where the incidence is 100%, were fed to the wrasses. Over half of these fishes were later found to be infested with *P. maculatus*; but the level of infestation decreased temporally. None were left after 6 days in *C. rupestris;* but on one occasion 5 specimens remained in *S. melops* for about 12–15 days. There were no significant morphological differences between the parasites from the invertebrate and the vertebrate hosts. The infestations in these wrasses were believed to be the result of being fed with the infested kidneys and it is possible that these parasites never survive for long in the fish-host.





continued

From BRAY AND GIBSON, 1980

Proctoeces maculatus (Looss, 1901) Odhner, 1911 (continued)

'Progenetic metacercariae', or 'fully adult', *P. maculatus* have also been found in the gastropods *Buccinum undatum* (kidney) in the North Sea, *Nucella lapillus* in the English Channel (see above), *Gibbula umbilicalis* (intestine & radula) from Morocco (Dollfus, 1965, 1966), *Turbo cornutus* (kidney) from Japan (Ichihara, 1964, 1965) and *Rissoa splendida* (body-cavity) from the Black Sea (Dolgikh, 1965*b*, 1967). Loos-Frank (1969) believed that the whole life-history of this parasite could be completed in the whelk *Buccinum undatum*. Two further records, of unencysted non-ovigerous metacercariae of *Proctoeces*, may be the same species. These are those of Yamaguti (1938) from the liver of the bivalve *Brachidontes senhausi* and of Shimazu (1972) from between the epipodium and mantle of the gastropod *Haliotus discus hamai*. Both of the latter records are from Japan.

Timon-David (1934) described *Metacercaria psammechini* from the muscles of Aristotle's lantern, in the echinoderms (sea-urchins) *Psammechinus microtuberculatus* and *Sphaerechinus granularis* in the Mediterranean. He considered that it possibly belonged to *Proctoeces*, in the family Steringophoridae and pointed out that labrids commonly feed on echinoderms. In 1938, however, he stated that he was unsuccessful in his attempts at experimental 'contaminations', and his hypothetical attribution of these specimens to be Steringophoridae could not be maintained. Although certain superficial characteristics are reminiscent of *Proctoeces*, it appears that a number of features, notably the excretory system, may not conform to the fellodistomid pattern.

PREVIOUS DESCRIPTIONS. Looss (1901 : 402; as *Distomum maculatum*); Linton (1907 : 106; as *Distomum subtenue*); Odhner (1911 : 108); Vlasenko (1931 : 100); Yamaguti (1934 : 410); Manter (1947 : 321; as *Proctoeces erythraeus*; 1954 : 528; as *P. subtenue*); Hanson (1950 : 83; figured); Koval, in Skrjabin & Koval (1957 : 394); Freeman & Llewellyn (1958 : 438; as *Proctoeces subtenuis*); Stunkard & Uzmann (1959 : 187); Manter & Pritchard (1962 : 115; figured); Freeman (1963*a* : 113; as *Proctoeces subtenuis*); Dollfus (1965 : 755; as *Proctoeces progeneticus*); Ichihara (1965 : 426; as *Proctoeces* sp.); Prevot (1965 : 178; figured); Dolgikh (1967 : 219); Naidenova (1967 : 487); Loos-Frank (1969 : 326; as *Proctoeces buccini*; 329; as *P. scrobicularíae*); Yamaguti (1970 : 39; as *Proctoeces hawaiiense*); Martinez (1974 : 39); Lang & Dennis (1976 : 66).

DESCRIPTION (Fig. 16). Six flattened whole-mounts were available for study. The subcylindrical worms taper at both ends and are widest at the level of the ventral sucker (Fig. 16a & b). The body-surface is smooth. The dimensions are included in Table 12. The subterminal *oral sucker* is smaller than the subglobular to oval *ventral sucker*, which is situated at about one-third of the body-length from the anterior end. There is a short prepharynx, a well-developed, globular *pharynx* and an oesophagus which is variable in length, normally being short or apparently absent. The intestinal bifurcation occurs in the mid-forebody, and the caeca, which are often dilate terminally, reach back to about half-way between the posterior testis and the posterior extremity of the body.

The terminal *excretory pore* opens into a 'Y'-shaped vesicle, which bifurcates at about the level of the testes. The arms reach anteriorly to about the level of the pharynx.

Table 12 Dimensions of *Proctoeces maculatus* from the present material

Hosts	*Buccinum undatum*	*Scrobicularia plana*	*Halichaeres bivittata*	*Nucella lapillus*
Locality	Solent	Thames estuary	Bermuda	Devon
Length (mm)	2·3–4·4	2·6	1·46	1·7
Breadth (mm)	0·95–1·3	0·95–1·27	0·65	0·56
Length : forebody ratio	1 : 0·19–0·22	1 : 0·28	1 : 0·33	1 : 0·24
Oral sucker (mm)	0·27–0·36 × 0·30–0·44	0·23–0·23–0·24	0·20 × 0·28	0·17 × 0·18
Ventral sucker (mm)	0·40–0·54 × 0·49–0·64	0·35–0·37 × 0·42–0·43	0·33 × 0·40	0·30 × 0·38
Sucker-ratio	1 : 1·5–1·7	1 : 1·7–1·9	1 : 1·4	1 : 1·7
Pharynx (mm)	0·18–0·27 × 0·20–0·27	0·19–0·21 × 0·15–0·18	0·23 × 0·17	0·15 × 0·12
Oesophagus (mm)	0·00–0·09	0·02–0·04	0·05	0·04
Cirrus-sac (mm)	0·42–0·64 × 0·20–0·32	0·39–0·48 × 0·11–0·13	0·34–0·13	0·32–0·09
Testes (mm)	0·19–0·33 × 0·15–0·33	0·13–0·22 × 0·15–0·25	0·16–0·23 × 0·13–0·14	0·15–0·16 × 0·11–0·12
Ovary (mm)	0·19–0·23 × 0·14–0·24	0·13–0·17 × 0·14–0·18	–	0·13 × 0·13
Eggs (μm)	42–53 × 22–30	27–52 × 13–28	–	47–54 × 24–26

—OVER—

The globular or subglobular *testes* lie in tandem to obliquely in the middle of the hindbody. The vasa efferentia pass forward, uniting almost immediately before they pass through the wall of the *cirrus-sac*. The latter organ, which is elongate-oval to claviform varies in position from being entirely in the hindbody, to partly in the forebody (Fig. 16a & b), but usually lies postero-dorsal, postero-lateral, dorsal or antero-dorsal to the ventral sucker. Its actual position depends upon the degree of contraction of the genital atrium. The cirrus-sac contains the entire seminal vesicle, the pars prostatica and the ejaculatory duct (Fig. 16c). The small, tubular seminal vesicle is coiled at the proximal extremity of the cirrus-sac. The well-developed, wide pars prostatica fills much of the cirrus-sac, sometimes extending to its proximal extremity. It is almost straight to arcuate, and possesses a filamentous lining and a dense covering of gland-cells that fill much of the space remaining in the cirrus-sac. The ejaculatory duct is short, muscular and capable of being everted to form a small, conical cirrus. Beside the opening of the male duct, or the cirrus, is a prominent muscular papilla. The cirrus and associated papilla may be extruded through the genital pore in certain specimens. The genital atrium is variable in length, but is usually long (deep) and narrow (Figs 16a & b). The genital pore lies ventrally to the left of the median line at about the level of the intestinal bifurcation.

The *ovary* is globular or slightly lobed, and is usually slightly smaller than the testes. It lies anteriorly to the testes, more or less in the median line. The oviduct leaves the ovary mid-ventrally and passes posteriorly, receiving Laurer's canal, and then ventrally, receiving the common vitelline duct, before entering an inconspicuous Mehlis' gland and dilating to form a distinct oötype. Laurer's canal is short, simple and opens mid-dorsally at the level of the region between the ovary and the anterior testis (Fig. 16d). There is no seminal receptacle, and although no uterine seminal receptacle has been reported or is visible in the flattened whole-mounts which we have examined, we suggest that, in the absence of any other seminal storage mechanism, one may be present. The *uterus* is variable in size, usually extending throughout the hindbody, occasionally filling it, or sometimes consisting of only a small number of loops. It initially loops posteriorly towards the posterior extremity, whereupon it passes forward to about the level of the ovary, where it forms a distinct, muscular metraterm. The latter duct passes anteriorly more or less directly and enters the base of the genital atrium. The uterine coils, which reach extra-caecally, occur mainly posterior to the testes, lateral to the testes, and to a lesser extent between the ovary and the ventral sucker. The uterus contains numerous operculate eggs with unmodified shells. The *vitellarium* is irregularly follicular, the follicles exhibiting different degrees of development. The follicles occur in two symmetrical, lateral fields, the normal limits of distribution of which are the levels of the anterior margin of the ovary and the posterior margin of the hind testis, but they occasionally overreach these limits. Alternatively, the vitellarium may be greatly reduced or difficult to distinguish, and apparently consist of only a few scattered globular or elongate follicles (Figs 16a & b). The main transverse vitelline collecting ducts, when visible, unite postero-ventrally to the ovary and form a short common vitelline duct. The latter may swell, forming a small vitelline reservoir.

Discussion. Looss (1901) originally described this species, as *Distomum maculatum*, from the labrids *Labrus merula*, *Thalassoma* [=*Crenilabrus*] *pavo* and *Symphodus cinereus* [=*Crenilabrus griseus*] in the Adriatic Sea at Trieste. Linton (1907) then described a similar worm as *Distomum subtenue* from the sparid *Calamus calamus* and the labrids *Bodianus rufus* [=*Harpe rufa*], *Halichaeres* [=*Iridio*] *bivattata* and *Lachnolaimus maximus* from off Bermuda. It was not differentiated from *D. maculatum*, but the egg-measurement given is rather smaller. Further studies, however, have shown egg-size to be a particularly unreliable criterion for this species, and no further convincing evidence has been produced to uphold the validity of *D. subtenue* as a distinct species.

In 1911 Odhner erected the genus *Proctoeces* for *D. maculatum* and a new species, *P. erythraeus*, from *Sparus* [=*Chrysophrys*] *bifasciata* and *Thalassoma* [=*Iulus*] *lunare* in the Red Sea. Subsequent studies (Hanson, 1950; Freeman & Llewellyn, 1958) have shown that *P. erythraeus*, which was originally distinguished on egg-size, sucker-size and vitelline configuration, falls well within the known morphological range of *P. maculatus*. Recent workers (Manter & Pritchard, 1962; Overstreet, 1969; Lang & Dennis, 1976) have considered both *P. subtenuis* and *P. erythraeus* as synonyms of *P. maculatus*.

Proctoeces major Yamaguti, 1934, was originally described from *Pagrosomus auratus* off Japan. It was said to differ from *P. maculatus* in having a distinctly trilobed ovary. Although in some fellodistomid groups the ovary appears to be constant, in others it varies considerably. Despite the fact that the ovary of *P. maculatus* is usually described as globular, occasional specimens of this species with a trilobed ovary have been found (Vlasenko, 1931; Freeman, 1963*b*; Dollfus, 1965). Dolgikh (1967) figured a specimen which she called '*P. major* (?)' that was found in her collection of *P. maculatus* from the gastropod *Rissoa splendida* in the Black Sea. Ichihara (1965) described *Proctoeces* sp. from the gastropod *Turbo cornutus* in Japan as having 54% of the specimens with trilobed ovaries and 46% with globular ovaries. Ichihara's specimens are herein considered to be *P. maculatus*. We tentatively include *P. major* as a synonym of this species; but we note certain morphological similarities between Yamaguti's (1934) description of *P. major* and *Xenopera insolita* Nicoll, 1915. The posterior limit of the caeca is closer to the posterior extremity than is apparent in the descriptions of *P. maculatus*, and there is a hint of an external seminal vesicle in Yamaguti's figure (1934, fig. 79).

Dollfus (1965) described *P. progenetieus* from *Gibbula umbilicalis* in Morocco. The differentiating features that he invoked are not convincing, and his specimens fit into the known variation described by Freeman & Llewellyn (1958). Dollfus' figures 2 and 3 illustrate the condition of the worm when the copulatory organ is extruded through the genital pore. The variations described by Freeman & Llewellyn also encompass the specimens described as *P. buccini* and *P. scrobiculariae*, giving their reasons for considering it a synonym of *P. maculatus*. In 1970 Yamaguti described *P. hawaiiense* from *Monotaxis* sp. (? *grandoculis*) off Hawaii. He differentiated it from *P. lintoni* Siddiqi & Cable, 1960, but not from *P. maculatus*, and his three specimens do not appear to be distinguishable from the latter, especially from the specimen from Hawaii figured by Manter & Pritchard (1962).

In synonymizing all of these species with *P. maculatus*, we are accepting that it must be a variable species occurring in widely dissimilar hosts. Perhaps its variability is the result of a wide host-tolerance; but both Freeman & Llewellyn (1958) and Stunkard & Uzman (1959) found a high level of variation in specimens from *Scrobicularia plana* and *Mytilus edulis*, respectively.

FROM BRAY AND GIBSON, 1980

1. *Proctoeces buccini* n. sp. Loos-Frank, 1969

Wirt: *Buccinum undatum* L.

Organ: Niere.

Locus typicus: Nordsee bei Insel Mellum.

Holotyp: in Alkohol fixiertes und in Gowers Carmin gefärbtes Totalpräparat.

Trematoden von schlankem, aber zu großer Kontraktion fähigem Äußerem, mit stark vorspringendem großen Bauchsaugnapf, der ihnen in Seitenansicht die Gestalt eines Y verleiht (Abb. 1b). Kurzer Vorderkörper und schmalerer Hinterkörper. Tegument unbestachelt, dick.

Mundsaugnapf verhältnismäßig groß, fast kugelig. Präpharynx sehr kurz, nur in Schnitten erkennbar. Pharynx nur wenig kleiner als Mundsaugnapf, etwas breiter als lang. Ösophagus kurz. Darmschenkel schmal, nicht bis zum Körperhinterende reichend, mit hohen Zellen ausgekleidet. Bauchsaugnapf groß, breiter als lang, mit quergestellter Öffnung (Abb. 1a).

Exkretionsblase mit flachen Zellen ausgekleidet. Schenkel reichen bis zur Höhe der Darmbifurkation und vereinigen sich im zweiten Drittel des Hinterkörpers zu einem unpaaren Stamm, der kurz vor dem Austritt von einer Gruppe kleiner Drüsenzellen umgeben ist.

Testes kugelig, schräg hintereinander. Vasa efferentia direkt am Hinterrand des Cirrusbeutels vereinigt. Cirrusbeutel, gewundene Samenblase, Pars prostatica, Prostatadrüsen, kurzer Cirrus und muskulöser Bulbus wie in anderen bisher beschriebenen Arten. Genitalatrium lang und schmal, Genitalporus kurz vor dem Bauchsaugnapf, deutlich nach links verschoben.

Ovar oval, länger als breit! Zwischen vorderem Hoden und Cirrusbeutel gelegen, meist dorsal etwas über dessen distales Ende geschoben. Ovidukt vom Ovar aus nach hinten ziehend, nach einer Dorsalbiegung Einmündung des Laurerschen Kanals, nach erneuter Ventralbiegung Einmündung des Dotterganges, danach von der großen, lockeren Mehlisschen Drüse umgeben. Dann erweitert sich der Ovidukt zum nach hinten ziehenden Uterus, dessen Hauptmasse zwischen Ovar und Körperende liegt. Einmündung in das Genitalatrium ventral kurz vor der Cirrusbeutel-Öffnung.

Die unscheinbaren und schwer sichtbaren Dotterstöcke bestehen aus 40—80 µ großen Follikeln (Abb. 3a), die zwischen Vorderrand des Ovars und Hinterrand des zweiten Hodens hauptsächlich in der lateralen Körperregion liegen, aber auch nach dorsal und ventral übergreifen. Dottergang und kleines Dotterreservoir zwischen Ovar und vorderem Hoden im Leben gut sichtbar.

Eier oval, bräunlich, mit kleinem Knötchen an einem Pol. Deckel am anderen Pol springt nach Fixierung der Würmer oder beim Schlüpfen der Miracidien auf, sonst nicht sichtbar. Miracidien sehr lang bewimpert, schlüpfen aus den meisten Eiern aus, sobald diese in Seewasser gelangen, starben aber sofort ab.

Erst an fixierten Würmern wurden zwei verschiedene Eigrößen mit Mitteln von 29 × 18 µ und 50 × 25 µ gemessen und zwar beide im gleichen Wurm nebeneinander (Abb. 4). Da diese Beobachtung erst gemacht wurde, als keine lebenden Würmer mehr vorhanden waren, kann nur vermutet werden, daß es sich um unbefruchtete und um embryonierte Eier handelt. STUNKARD and UZMANN (1959) berichten das gleiche von einer *Proctoeces*-Art aus Mytilus edulis, geben aber von den kleineren Eiern keine Maße an.

(OVER)

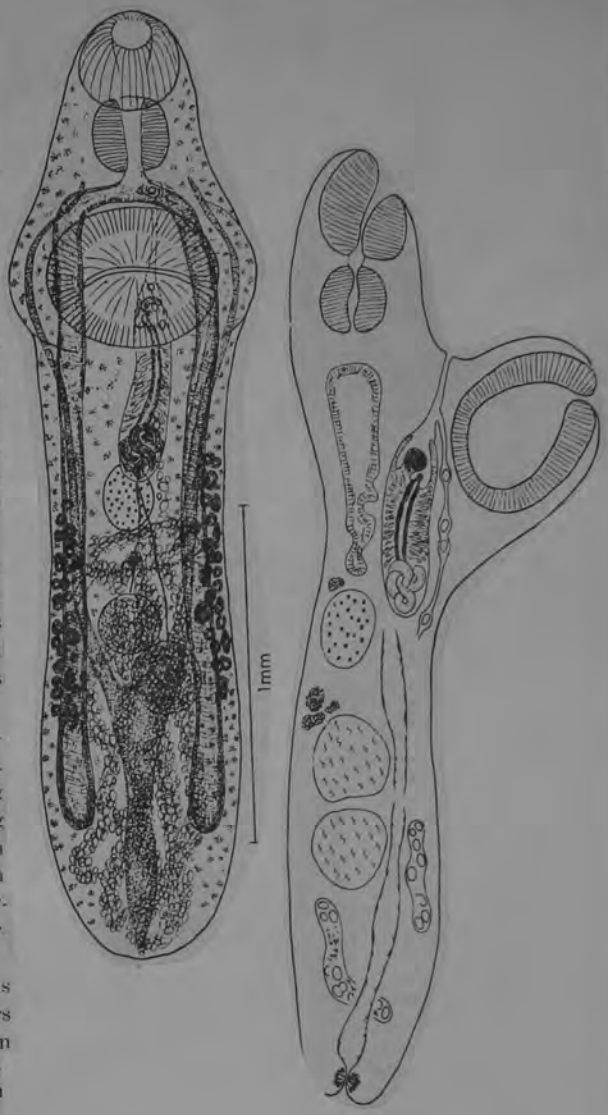


Tabelle 1. *Maße (in µ, nur Länge in mm) von je 10 fixierten und gepreßten P. buccini* n. sp. *und P. scrobiculariae* n. sp. *In Klammern die Durchschnittswerte*

	P. buccini	*P. scrobiculariae*
Länge	2.1—3.5 (2.8)	2.6—3.5 (3.0)
Breite über Bauchsaugnapf	620—853 (736)	806—1163 (895)
Breite über Testis II	403—698 (591)	682—930 (771)
Mundsaugnapf	224—360 (295)	192—240 (230)
Pharynxlänge	168—248 (221)	160—184 (170)
Pharynxbreite	184—256 (229)	144—178 (162)
Ösophagus	40—80 (53)	96—240 (153)
Bauchsaugnapflänge	376—496 (423)	320—400 (358)
Bauchsaugnapfbreite	440—568 (510)	400—488 (440)
Körpervorderende bis Bauchsaugnapf-Zentr.	612—1184 (792)	744—1080 (893)
Ovarlänge	178—235 (200)	143—216 (192)
Ovarbreite	118—185 (146)	163—200 (181)
Testis I	134—241 (181)	184—248 (206)
Testis II	216—274 (213)	208—320 (241)
Eilängen	26—33 (29) 48—54 (50)	29—67 (43)
Eibreiten	14—22 (18) 26—29 (28)	22—35 (29)

	Proctoeces buccini	*Proctoeces scrobiculariae*
Vorderende	breit, abgerundet	zugespitzt
Hinterkörper	schmal	breit
Form des Bauchsaugnapfes	stark vorspringend, Körper in Seitenansicht Y-förmig	wenig hervortretend, Körper in Seitenansicht flach dreieckig
Lage des Bauchsaugnapfes	auf der Grenze von 1. und 2. Körperviertel	auf der Grenze von 1. und 2. Körperdrittel
Stärke der Darmschenkel	100—150 µ	130—200 µ
Ovar	länglich	rund
Dotterstockfollikel	40—80 µ	10—50 µ
Uteruswindungen	zwischen Ovar und Körperende	zwischen Bauchsaugnapf und Körperende
Eimaße	2 Größentypen: 28 × 18 µ, 50 × 29 µ	variabel zwischen 34 × 24 bis 67 × 34 µ

P. subtenues (Linton, 1907) Hanson, 1950

Proctoeces erythraeus Odhner, 1911

This species is distingyished from P. maculatus (Looss) at first glance by the acetabulum being 1/3 smaller. In a full grown specimen of 3 mm. it had a diameter of 0.38 to 0.4 mm. and must have had anumcompressed size of at most 0.3 mm. Eggs appear much smaller, about 45 u long. Finally, the vitellaria appear somewhat shorter since their posterior border appears to lie at the anterior edge of the hind testis. No figure given.

Host: Chrysophrys bifasciata, porgy; and immature in Iulis lunaris

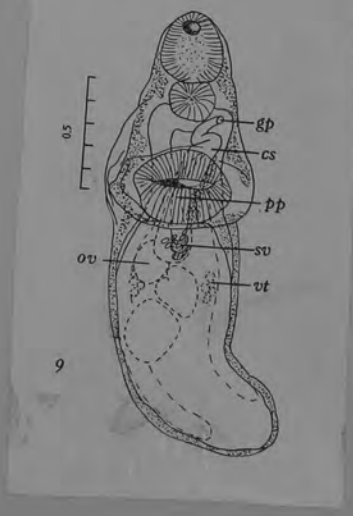
Locality: Red Sea

Hanson, 1950

21. *Proctoeces subtenue* (Linton, 1907) ~~n. comb.~~ (Fig. 9) Synonyms: *Distomum subtenue* Linton, 1907; *Proctoeces erythraeus* Odhner, 1911. Host: Porgy, *Calamus* sp. Location: Intestine.

When Odhner (1911) described *Proctoeces erythraeus* from the Red Sea, he distinguished it from *P. maculatus* (Looss, 1901) Odhner, 1911 on the basis of smaller ventral sucker, less extensive vitellaria, and smaller eggs. Dawes (1946) considered *P. erythraeus* a synonym of *P. maculatus*, stating that of the above mentioned differences only the smaller egg size was of significance and that was "marred by the fact that only a solitary specimen was found." Manter (1947)[6] retained the species on the basis of six additional specimens collected from *Calamus bajonado* and *C. calamus* (porgies) at Tortugas. The two specimens from the porgy (*Calamus* sp.) at Bermuda also agree with the description of *P. erythraeus* in sucker ratio, vitelline extent, and egg size. Linton's (1907) description of *Distomum subtenue* also collected from *Calamus calamus* at Bermuda agrees with the description of *P. erythraeus* sufficiently to be considered the same species. The valid name of the species is, therefore, *Proctoeces subtenue* (Linton, 1907) n. comb.

Very conspicuous glands extending from the anterior to the posterior extremities of the body were first thought to be vitellaria. Sectioning proved the vitellaria to be located lateral to the anterior testis and obscured by the uterus. The glands were also noted by Looss (1901) in *P. maculatus* and by Yamaguti (1934) in his description of *P. major*.



Reported by Manter (1954) from Latridopsis ciliaris in New Zealand.

L. *Family FELLODISTOMATIDAE Nicoll, 1935*

Proctoeces subtenue (Linton, 1907) Hanson, 1950

Host.—Calamus bajonado (Bloch & Schnieder), jolt-head porgy.

Location.—Intestine.

Locality.—Lerner fish pens, N. Bimini, B.W.I. [new locality record].

Discussion.—P. subtenue was reported from *Calamus* at Bermuda by Linton (1907) and Hanson (1950) and from *Calamus* spp. at Tortugas by Manter (1947) under the name of *P. erythraeus* Odhner, 1911. Odhner described his material from *Julis lunaris* and *Chrysophrys bifasciatus* in the Red Sea. Hanson considered *P. erythraeus* a synonym of *P. subtenue*, which is found almost exclusively in the family Sparidae from Bermuda, Tortugas, Fla., Bimini, B.W.I. and the Red Sea. *Julis lunaris* is a Labrid fish. *P. subtenue* is also reported from New Zealand (Manter, 1954) from *Latridopsis ciliaris*, family Latridae.

Sogandares, 1959

Proctoeces erythraeus Odhner, 1911

Proctoeces erythraeus n. sp. Odhner, 1911

Diese Art unterscheidet sich auf den ersten Blick von der vorigen dadurch, daß der Bauchsaugnapf wenigstens um ein Drittel kleiner ist. Bei einem ausgewachsenen Exemplar, das im Quetschpräparat etwa 3 mm mißt, betragen die Durchmesser des Saugnapfes 0,38 bzw. 0,4 mm, was auf eine ungepreßte Größe von höchstens 0,3 mm schließen läßt. Die Eier sind stark zusammengeknittert, scheinen indessen viel kleiner zu sein als bei *Pr. maculatus*, etwa 0,015 mm lang. Endlich sind anscheinend die Dotterstöcke [illegible] kürzer als bei der mediterranen Art, indem ihre hintere Grenze schon am Vorderrande des hinteren Hodens zu liegen scheint.

[illegible] Von späteren Verfassern (Clapar[illegible] 1868, Vallot 1879, Monticelli 1888) ist dieser Name dann für eine andere Distomenspecies gebraucht worden, die sich u. a. durch einen [illegible] Bauchsaugnapf [illegible] Form unterscheidet.

Ein reifes Exemplar aus *Chrysophrys bifasciata* und zwei unreife aus *Iulis lunaris*, alle gequetscht vorliegend (Tor, Rotes Meer, 1901, [illegible]se leg.).

Die vorliegende Gattung gibt ein sehr zu beachtendes Beispiel davon ab, daß man bei der Ergründung der verwandtschaftlichen Beziehungen der »Distomen« mitunter durch rein histologische Merkmale auf die richtige Spur geführt werden kann. Auch nachdem mir die Y-förmige Ausbildung der Excretionsblase bekannt geworden war, waren mir nämlich die Beziehungen von *Proctoeces* so lange völlig rätselhaft, als ich mir noch keine Schnitte hatte machen lassen. Erst an der Hand von solchen konnte ich überhaupt erkennen, daß die Gattung in Beziehungen zu *Steringophorus* steht. Looss erwähnt nach Quetschpräparaten von *Pr. maculatus*, daß »massige, gruppenförmige Anhäufungen von großen (augenscheinlich Drüsen-) Zellen mit im konservierten Zustand spongiösem Plasma« überall, ganz besonders aber im Vorderkörper[17] unter den Hautschichten zu finden sind. Diese Zellen, die sich mit Hämatein ganz außerordentlich stark tingieren, fallen noch mehr in Schnitten auf den ersten Blick auf; ganz ähnliche Zellen in freilich nicht ganz so starker Entwicklung waren mir indessen von *Steringophorus furciger* schon lange bekannt, und weiter zeigt in beiden Fällen zugleich die ganze Körpercuticula dieselbe auffallende Färbbarkeit wie jene subcuticularen Drüsenzellen; mit diesen in Struktur und Färbungsreaktion übereinstimmende Zellen sind weiter bei beiden Gattungen auch in den Saugnäpfen reichlich vorhanden. Auch das Darmepithel zeigt bei *Proctoeces* und *Steringophorus* eine auffallende Ähnlichkeit: es ist ein wohl entwickeltes, dicht zusammengeschlossenes Cylinderepithel mit deutlichen Zellgrenzen und wenig vacuolisiertem Plasma.

Daß diese histologischen Ähnlichkeiten auf eine wirkliche Verwandtschaft zurückzuführen sind, stellen die anatomischen Übereinstimmungen außer Zweifel. In erster Linie ist da auf die Y-förmige Excretionsblase hinzuweisen. Im Genitalapparat begegnet uns bei beiden Gattungen dieselbe Lage des Genitalporus; der Genitalsinus ist bei *Proctoeces* bedeutend erweitert und die Samenblase anders gestaltet, die Pars prostatica zeigt aber eine ähnliche Ausbildung wie bei *Steringophorus*, und für die eigentümlichen muskulösen »Lippen« an ihrer Mündung ergibt sich eine befriedigende morphologische Erklärung, wenn man sie auf den kurzen und weiten, gefalteten Cirrus der Steringophoriden zurückführt. Daß die Hoden im einen Falle neben, im andern hintereinander placiert sind, bedeutet bei ihrer leichten Verschiebbarkeit gar nichts. Die weiblichen Genitalorgane folgen ungefähr demselben

[17] Auch am Hinterrande des Bauchsaugnapfes sind mächtige Pakete von diesen Drüsenzellen vorhanden.

from Odhner, 1911

P. erythraeus seems not to be a valid species. Identifications of several forms of *Proctoeces* from all over the world with *P. maculatus* and *P. subtenuis* should be re-examined in the light of zoogeographical considerations and better morphological comparisons.

From Loos-Frank, 1969

Subfamily HETERORCHIINAE Dollfus, 1950

50. *Proctoeces hawaiiensis* ~~n. sp.~~

(Fig. 50) Yamaguti, 1970

HABITAT: Intestine of *Monotaxis* sp. (*Monotaxis grandoculis*?); Hawaii.

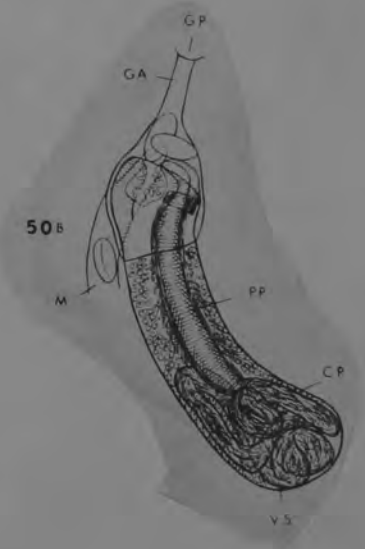
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63573.

DESCRIPTION (based on three whole mounts): Body plump, 0.7-1.8 mm long, 0.4-0.6 mm wide, rather rounded at each end. Oral sucker terminal, 0.14-0.22 X 0.2-0.3 mm, with its anterodorsal border projecting beyond terminal mouth aperture. Prepharynx slit-like; pharynx strongly muscular, 0.12-0.18 X 0.15-0.22 mm. Esophagus short; ceca wide, terminating at posterior extremity. Acetabulum prominent, 0.2-0.3 X 0.23-0.35 mm, pre-equatorial.

Testes subglobular, 0.08-0.17 mm in diameter, situated diagonally at junction of middle with posterior third of body. Cirrus pouch claviform, curved, with its somewhat swollen distal end projecting into base of genital atrium, 0.25-0.45 X 0.08-0.12 mm, with markedly thickened muscular wall on one side distally, extending to ovary a little posterior to acetabulum, containing tubular, winding seminal vesicle and pars prostatica provided with a thick outer layer of longitudinal muscles and a thin inner layer of circular muscles and lined with cilia directed obliquely outward. Prostate cells densely massed, with their ducts converging toward the above-mentioned muscular pars prostatica. Pars prostatica apparently opening directly into genital atrium. A short muscular cirrus differentiated. Genital atrium tubular, enlarged at base to enclose distal end of cirrus pouch, into which extends an atrial recess lined with folded cuticle, may be saccular when filled with eggs, opening ventrally slightly to left of median line anterior to acetabulum about midway between pharynx and acetabulum.

Ovary rounded, 0.1-0.18 X 0.07-0.15 mm, situated at base of cirrus pouch behind acetabulum anterior to testes. No seminal receptacle. Laurer's canal opening dorsally posterodorsal to ovary. Uterus occupying all available space of hindbody posterior to ovarian level; metraterm running alongside cirrus pouch. Eggs elliptical, 50-53 X 22-25 μ in life. Vitelline follicles comparatively small, distributed in dorsolateral area at ovariotesticular level. Extent of excretory vesicle not determined.

DISCUSSION: This species differs from the most closely related *Proctoeces lintoni* Siddiqi et Cable, 1960 from the Caribbean *Calamus calamus* in the genital atrium enclosing the swollen distal end of the cirrus pouch, into which the atrium extends in the form of a recess lined with folded cuticle. In *P. lintoni* the eggs measured 54-57 μ by 15-18 μ, according to Siddiqi and Cable. If this is correct there is a marked difference in the width of eggs, because in the Hawaiian species the eggs measured 50-53 μ by 22-25 μ in life. We have been unable to find *Proctoeces maculatus* (Looss, 1901) described by Manter and Pritchard (1962) from *Thalassoma duperreyi* from Hawaii.



Proctoeces ichiharai Shimura and Egusa, 1979

Proctoeces ichiharai n. sp.
Host: *Batillus cornutus* SOLANDER (Turbinidae)
Habitat: Misaki (Kanagawa Pref.) (type locality) and Chikura (Chiba Pref.)
Date: Aug. 24, 1974
Type specimen: Meguro Parasit. Museum coll. Holotype No. 19228, Paratype No. 19229

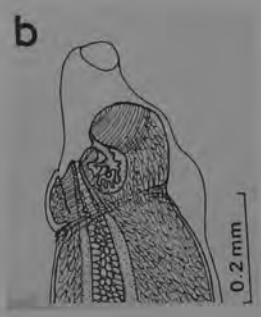
Description (Fig. 2)

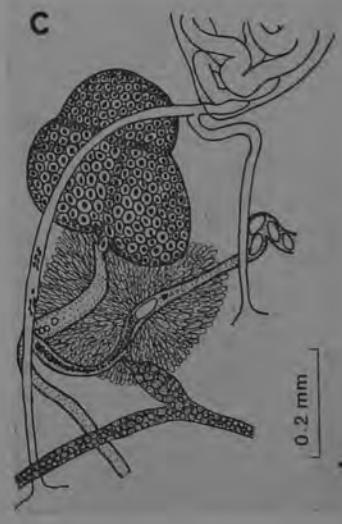
Based on 24 whole mount preparations of mature specimens. Body smooth, elongated, subcylindrical, tapering both ends, 3.82 to 8.89 mm long by 1.35 to 2.25 mm wide. Forebody whitish yellow or whitish pink, and hindbody yellowish brown due to brown egg capsules.

Oral sucker subterminal, subspherical, 206–573×382–703 μm. Acetabulum, 490–860×567–912 μm, situated at posterior end of first anterior third of body. Sucker ratio 1:1.1 to 1:1.5. Pharynx muscular, globular, 186–354×278–454 μm. Oesophagus very short, with postpharyngeal gland cells posteriorly. Intestine bifurcates at some distance anterior to acetabulum into two branches and terminates blindly near posterior end of body. Testes subglobular, obliquely tandem in posterior region of middle third of body. Anterior testis situated on the left side, 309–782×258–646 μm, posterior testis 330–867×299–685 μm. Each vas efferens runs forwards and meets together to from short vas deferens posterior to cirrus pouch. Cirrus pouch claviform, 729–1670×237–355 μm, left to acetabulum and extending from level of ovary to near intestinal bifurcation, containing irregularly coiled tubular vesicula seminalis in posterior third of the pouch, tubular pars prostatica and prostatic cells. Ejaculatory duct protruded into genital atrium, short, muscular, slightly curved inwards, facing muscular nodule, center of which possess irregularly folded cuticular pocket (Fig. 2b) at base of genital artium: Genital pore submedian, postbifurcal.

Ovary trilobate to ellipsoidal at pre-equatorial level, 330–641×299–612 μm. Vitelline glands finger-shaped, extending in lateral fields of body at ovario-testicular zone. Short oviduct arising from posterior side of ovary, giving off Laurer's canal, and joining median vitelline duct to form ootype surrounded by Mehlis' gland posterior to ovary (Fig. 2c). Laurer's canal opening dorsally in ovario-testicular region. Reseptaculum seminis absent. Uterus long and irregularly coiled descending to posterior end of body and ascending, occupying most of hind body and filled with eggs. Metraterm opens at base of muscular nodule into genital atrium. Egg embryonated and operculated, oval and brown, 71.7×28.3 μm (n=100) in life and 72.6×26.2 μm (n=307) in fixed specimens.

Excretory vesicle Y-shaped, stem bifurcates posterior to testes into two arms which extend ventral to caeca to level of oesophages in lateral fields of body, pore terminal.





(over)

Discussion

Fourteen species of *Proctoeces* have been described; *P. maculatus* (Looss, 1901[20]) Odhner 1911[21], (syn. *Distomum maculatum* L.): *P. erythraeus* Odhner 1911[21] (as syn. *P. subtenuis* by Hanson[22], Freeman and Llewellyn[4], as syn. *P. maculatus* by Prévot[8]): *P. ostreae* Fujita 1925[4]: *P. major* Yamaguti 1934[14] (as syn. *P. subtenuis* by Freeman[23]): *P. magnorus* Manter 1940[24] (as syn. *P. subtenuis* by Freeman and Llewellyn[4]): *P. subtenuis* (Linton 1907[25]) Hanson 1950[22] (syn. *Distomum subtenue* L., as syn. *P. maculatus* by Stunkard and Uzmann[5], Manter and Pritchard[15], Prévot[8], Lang and Dennis[18]): *P. insolitus* (Nicoll 1915[26]) Dollfus 1952[27] (syn. *Xenopera insolitus* N., as syn. *P. subtenuis* by Freeman[23]): *P. macrovitellus* Winter 1954[28] (excluded from this genus by Freeman and Llewellyn[4]): *P. lintoni* Siddiqi and Cable 1960[29]: *P. neomagnorus* Siddiqi and Cable 1960[29]; *P. progeneticus* Dollfus 1964[6]: *P. buccini* Loos-Frank 1969[11]: *P. scrobiculariae* Loos-Frank[11] (as syn. *P. subtenuis* by Lang and Dennis[18]): *P. hawaiiensis* Yamaguti 1970[30].

The distinct characteristics of *P. ichiharai* are the size of the body (the long body), egg diameter and variation of ovary. The size of body is the largest among *Proctoeces* spp., and the largest specimen of our collection measuring 8.9 mm in length (9.6 mm by Ichihara[7]). The other species of relatively large body size are; *P. major*, 5.96 mm (Yamaguti[14]), *P. maculatus*, 4.46 mm of the specimen of not subjected to pressure (Yamaguti[14]), *P. subtenuis*, 4.8 mm (Freeman and Llewellyn[4]). The remaining species are smaller than 4 mm. In *P. maculatus*, Odhner[21] observed numerous eggs even in small specimens of 1 mm in body length, however, the corresponding stage in the present species is restricted to the specimens more than 5 mm long. Notably the quantity of egg decreased in the specimens more than 7 mm and only one specimen of 8.9 mm in length lacking mature eggs was also observed.

The egg size of the present species is also the largest of all the member of this genus with the exception of that of *P. maculatus* which is equal to that of the present species. The egg size of *P. maculatus* are: 70×26 μm (Looss[20]), 72–79×27 (Odhner[21]), 74×26 (Wlassenko[31]), 66–76×26–34 (Yamaguti[14]), 74×27 (Skrjabin and Koval[32]), 64–67×21–24, 48–75×18–29 (Manter and Pritchard[15]). However, the egg size of *P. maculatus* from *M. edulis* (Stunkard and Uzmann[5], Lang and Dennis[18]) and from *R. splendida* (Dolgikh[9,10]) are smaller, therefore the identification of these specimens might require re-examination. The egg size of all other species are less than 60 μm in longest diameter, mostly around 40–50 μm, although Freeman and Llewellyn[4] observed the exclusively large egg of 73×30 μm in *P. subtenuis* from *S. plana*.

The ovarian shape shows variation which comprize trilobate or triangular 47% (33/70), ellipsoidal 34% (24/70), reniform 13% (9/70), bilobed 3% (2/70) and others 3% (2/70) (trilobate 54% and globular 46% [Fig. 5 and 11] by Ichihara[7]). *P. major*[14] and a single specimen of *P. subtenuis* (Freeman[23]) have trilobate ovaries, meanwhile all other species have globular or subglobular ovaries.

The other differences are: *P. ostreae*, *P. major* and *P. buccini* have large acetabula compared to body width. *P. subtenuis* from *S. plana* and *P. scrobiculariae* have relatively protruded anterior ends. *P. magnorus* and *P. neomagnorus* have larger acetabula than oral suckers, *P. progeneticus* has poor vitelline glands. *P. insolitus* has vesicula seminalis externa. Vesicula seminalis of distal portion of *P. lintoni* being sack-shaped. *P. macrovitellus* has relatively large size nd small numbers of vitelline glands.

Some members of the genus *Proctoeces* attain maturity as adult in molluscan hosts: *P. maculatus* from *M. edulis* (Stunkard and Uzmann[5], Lang and Dennis[18]), *P. subtenuis* from *S. plana* (Freeman and Llewellyn[4]), *P. scrobiculariae* from *S. plana*, *P. buccini* from *B. undatum* (Loos-Frank[11]) and *Proctoeces* sp. from *T.* (*B.*) *cornutus* (Ichihara[7]). The present authors regarded *P. ichiharai* as a true adult and not a progenetic metacercaria and *B. cornutus* as a final host on the following grounds; numerous mature eggs containing motile miracidia were observed in the uterus and the metraterm of the worm, and the larger sized specimens (more than 7 mm long), apparently aged worm, were collected, having less number of mature eggs as compared with those of normal sized worm (5–7 mm long) which suggested that in these so-called "post-adult" specimens the most of the mature eggs were discharged when collected.

Morphological observations were based on living parasites stained by neutral red and whole mount preparations fixed in Schaudinn's solution, stained by Heidenhein's haematoxylin and mounted in canada balsam. Eggs from specimens fixed in hot formalin (90°<) were also measured. In hot formalin, living parasites instantly shrinked in definite from. The body length of the specimens fixed in hot formalin corresponded to about 0.7 times as large as that of mount preparations. Drawings were made with the aid of a camera lucida.

Localization in Host (Fig. 1)

Almost all the parasites were found in the distal end, some in the proximal end or middle part of the renal coelom of the kidney. Only two parasites were also taken from the buccal cavity of the host.

Fellodistomidae

Proctoeces sp. Ichihara,1965

ON A TREMATODA (*PROCTOECES* SP) OF THE TOPSHELL, *TURBO BATTILUS CORNUTUS* SOLANDER

I. GEOGRAPHICAL DISTRIBUTION IN JAPAN AND OBSERVATIONS ON THE ADULT FLUKE

ATSUO ICHIHARA

(Meguro Parasitological Museum, Tokyo)

Topshells, *Turbo cornutus* Solander collected in thirteen localities of Japanese coast (Fig. 1, 2 Table 1) were dissected, and an adult trematode which belongs to *Proctoeces* sp. was found in the kidney (Fig. 3) of the topshells collected in three localities. Its infection rates are as follows: Nojimazaki (Pf. Chiba) 43 % (27/63), Akiya (Pf. Kanagawa) 24.2 % (39/160), Miyazaki (Pf. Kanagawa) 13.0 % (1/8). The localities where the trematode was not found are as follows. Figures show the number of the hosts examined. Fukaura (Pf. Aomori) 20, Sado (Pf. Niigata) 10, Oshima (Pf. Tokyo) 11, Numazu (Pf. Shizuoka) 8, Irozaki (Pf. Shizuoka) 14, Kashimamachi (Pf. Shimane) 5, Ejima (Pf. Hyogo) 7, Akune (Pf. Kagoshima) 13, Tsushima (Pf. Nagasaki) 18, Aoshima (Pf. Miyazaki) 3.

As the topshells collected in the negative localities are not sufficient in number, it cannot be concluded that the topshells of those localities are free from *Proctoeces* sp. It seems, however, that the areas in which topshells infected with the trematode dwell are limited.

The characters of identifying the trematode with the genus *Proctoeces* are as follows: Body cylindrical, length of cirrus pouch extend posterior to ventral sucker, tublar vesicula seminalis presence in cirrus pouch, receptacle seminalis abscent, vitellaria ovary-testicula zone. Body unencysted, large eggs full in uterus are enough to decide the trematode as an adult.

The general morphology (Fig. 4, 8, Table 2) based on the adult twenty specimens fixed, pressured and stained are as follows: Body elongated cylindrical, 7.05 mm×2.08 mm in mean, ventral sucker on peduncle elongated oval, and larger than oval sucker at the anterior third of the body. Ovary being posterior to ventral sucker shows the types in shape, trilobate and globular (Fig. 5, 11). The number of the former takes the majority. Globular testes posterior to ovary diagonal. Excretory tube being shaped separate into two arms at the level of the posterior testis extends to anterior to ventral sucker and runs to the dorsal side. Veteralia folicles which group in fingers like and situated in ovary testicular zone. Iregularly coiled uterus occupy the posterior part of body. Metratern opens in anterior to cirrus pouch. Club shaped cirrus pouch (Fig. 4, 9) contains cirrus slightly curved to inside and muscular nodule in anterior of cirrus pouch. The latter situates on the same level with cirrus or diagonal posterior to it as if covered it. Cirrus leads to pars prostatica which conects with tublar and coiled vesicula seminalis. The posterior extremity of vesicula seminalis shows often bulb shape. Uterine eggs

Fig. 4-1 *Proctoeces* sp. obtained from *Turbo cornutus*. (ventral view)

O.S-Oral sucker, Ph-Pharynx, P.g-Pharyngeal grand, V.s-Ventral sucker, O-Ovary, Sh.g-Shell gland, T-Testis, I-Intestine, G.p-Genital pore, D.herm.-Ductus hermaphroditicus, P.pr-Pars prostaica, Ex-Excretory tube, V.sm-Vesicula seminalis, V-Viterine gland, U-Uterus, E-Egg, G-Gland cell

elongated oval 67.4 μ×26.7 μ in mean based on measuring 100 eggs. Eggs variable in morphology (Fig. 4, 6, 7, 8). The calculations of organs are showed in Table 2. The proper morphological characters of the trematode from topshell are as follows.

1) The size of body and organs are the largest among *Proctoeces* spp.
2) The ovary varies in the shape trilobate 54 %, globular 46 % (Fig. 5, 11)
3) The muscular nodule is found at the posterior to the cirrus in many specimens.

As the present author conciders that this trematode is most closely related to *P. maculatus* except for the difference in the shape of ovary and in the situation of muscular nodule.

Some points regarding classifiction of *Proctoeces* spp. may be not clear and the *P. maculatus* is variable in size and shape, the specific name will be decided in future, *Proctoeces* from topshell has some peculier characters. The adult of *Proctoeces* was obtained from not only *Mytilus edulis* but also *Scrobicularia plana*. The larvae of *Proctoeces* were found from *Ostrea gigas* and *Brachidontes senhausi* in Japanese coast. The topshell *Turbo cornutus* is the fifth host of shell-fish and first one as prosobranch.

Fellodistomidae

Proctoeces lintoni ~~n. sp.~~ (FIGURE 49) Siddiqi & Cable, 1960

Description based on 2 specimens with characters of the genus. Body cylindrical, 1.634 to 1.968 long, 0.567 to 0.640 wide. Cuticle smooth, eyespot pigment absent. Oral sucker terminal, 0.20 to 0.207 by 0.267. Ventral sucker 0.260 to 0.273 by 0.30 to 0.354, in fleshy protuberance about one third body length from anterior end. Sucker ratio 1:1.25. Prepharynx absent, pharynx 0.160 to 0.180 in diameter, esophagus very short; ceca swollen, extending almost to posterior end of body. Genital pore submedian, about midway between ventral sucker and pharynx. Cirrus sac curved, extending slightly posterior to ventral sucker; cirrus short, muscular; pars prostatica long, tubular, surrounded by prostate cells; seminal vesicle bipartite, anterior division a long coiled tube, posterior division saclike. Testes 2, entire, close together, diagonal to almost tandem, within anterior half of hindbody, 0.153 to 0.233 in diameter. Ovary entire, submedian, near anterior testis, 0.127 to 0.167 by 0.113 to 0.133; seminal receptacle absent. Vitelline follicles sparse, confined to, and confluent in, zone of gonads. Uterus filling space posterior to ovary; metraterm simple. Eggs numerous, 0.054 to 0.057 by 0.015 to 0.018. Excretory vesicle Y-shaped with stem reaching testicular level; pore subterminal dorsally.

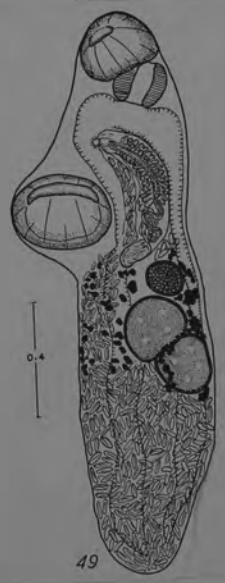
Host: *Calamus calamus*.

Site: intestine.

Locality: Cabo Rojo, P. R.

Type specimen: Holotype No. 39338.

Proctoeces lintoni agrees with *P. subtenue* except in having a bipartite seminal vesicle. We have reexamined Linton's material of *P. subtenue*, and Hanson has done the same with her specimens and those collected by Manter. All have found the seminal vesicle to be unipartite in *P. subtenue*.



49

Proctoeces lintoni
Siddiqi and Cable, 1960

Host: *Lagodon rhomboides* (2 of 5)*.
Site: Rectum. Overstreet, 1969

Proctoeces lintoni Siddiqi & Cable, 1960
Hosts: **Calamus arctifrons* (J); **C. bajanado* (J).
Site: intestine. Nahhas & Cable

JAMAICA 1964

Fellodistomidae
Haploceladinae

Proctoeces major n. sp. Yamaguti, 1934

Specific Diagnosis. *Proctoeces* Odhner, 1911; with generic characters. Body plump, 3.8–5.96 × 0.86–1.31 mm. Oral sucker 0.52–0.7 mm long. Pharynx 0.33–0.5 × 0.27–0.44 mm. Esophagus very short. Ceca at first passing transversely and then turning backwards at right angles, terminating at hind end of body. Acetabulum 0.53–0.76 × 0.72–0.96 mm, at junction of anterior with middle third of body. Testes approximately oval, closely oblique, at about middle of hindbody, 0.26–0.4 × 0.33–0.52 mm. Ovary trilobate, 0.31–0.43 × 0.36–0.53 mm, postequatorial. Genital pore a little to right of median plane, at level of cecal bifurcation. Eggs 0.037–0.04 × 0.021–0.022 mm. Excretory vesicle bifurcating at level of anterior end of caudal testis.

Habitat. Large and small intestines of *Pagrosomus auratus*.
Locality and date. Inland Sea; August 4, 1929.
Type and paratypes in my collection.

Discussion. This species bears a very close resemblance to the preceding, but differs distinctly in the size of the body, in the shape of the ovary and in the size of eggs.

Fellodistomidae

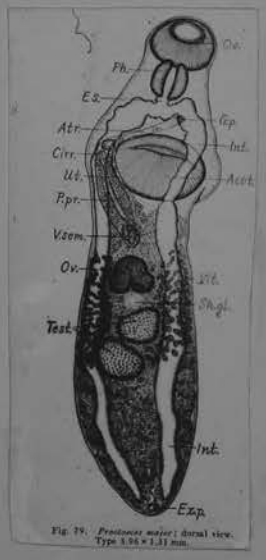


Fig. 79. *Proctoeces major*; dorsal view. Type 5.96 × 1.31 mm.

Proctoeces magnorus, ~~new species~~ MANTER, 1940
(Plate 45, fig. 95)

Host: *Caulolatilus anomalus* (Cooper) ?
Location: Intestine
Locality: Cerros Island, Mexico
Number: One specimen

SPECIFIC DIAGNOSIS OF PROCTOECES MAGNORUS

Body smooth, subcylindrical, equally wide along most of its length, posterior end pointed, anterior end blunt. Length 2.862, width 0.412; forebody 0.825; posttesticular space 0.640. Oral sucker 0.375 deep, 0.435 long; acetabulum on body stalk, 0.322 wide, 0.310 long, with transverse aperture; within its cavity is a longitudinal groove with muscular edges (fig. 95). Prepharynx very short; pharynx large, 0.307 long by 0.217 wide; esophagus very short; ceca thin walled, inconspicuous, reaching to near posterior end of body. Genital pore slightly to the left, at base of acetabular stalk, posterior to intestinal bifurcation. Testes spherical, diagonal, not far apart but separated by a few eggs in the uterus, in posterior half of body. Cirrus sac claviform, slightly curved, extending only slightly posterior to acetabulum; 0.502 long by 0.130 in greatest width (near its base), containing a coiled tubular seminal vesicle in its basal third; a long pars prostatica and a short cirrus. Genital atrium large. Cirrus may be inserted in terminal portion of uterus. Ovary spherical or subspherical, a short distance pretesticular, separated from testes by uterine coils; vitelline follicles few, in 2 lateral groups from anterior end of ovary to anterior end of anterior testis; extending medianly dorsal to uterus between ovary and testis; eggs 32 to 37 by 15 to 19 μ. Excretory vesicle not traced.

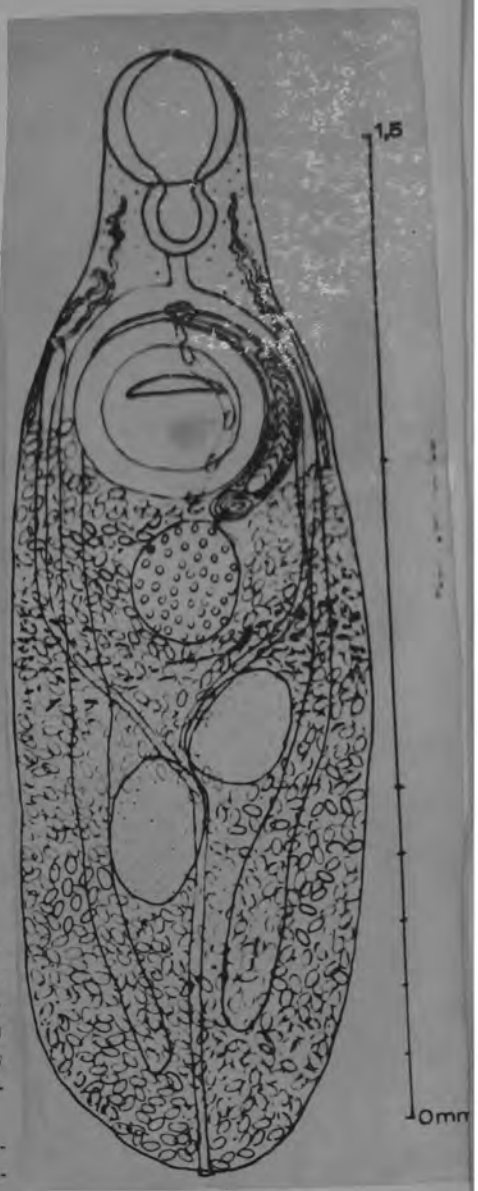
The name *magnorus* refers to the relatively large oral sucker.

Comparisons. Two species of Proctoeces have been described, *P. maculatus* (Looss) Odhner, 1911 from *Labrus merula* and *Crenilabrus pavo* from the Mediterranean (also reported by Yamaguti from several fishes of Japan) and *P. erythraeus* Odhner, 1911 from *Chrysophrys bifasciata* from the Red Sea. *P. magnorus* is very different from *P. maculatus* in sucker ratio, in extent of vitellaria, and in egg size. It is more similar to *P. erythraeus.* Odhner gives a very brief description and no figure of *P. erythraeus.* Compared with *P. maculatus,* the acetabulum is "at least ⅓ smaller," eggs about 45 μ long, and the vitellaria shorter. These differences are all in the direction of *P. magnorus,* which, however, seems to have a larger oral sucker, making the sucker ratio even greater than in *P. erythraeus,* and also to have smaller eggs (the largest of which is 37 μ long). It is probable the vitellaria are even shorter in *P. magnorus* than in *P. erythraeus.* Assuming the other 2 species are alike in other respects, *P. magnorus* shows slight differences in possessing an acetabular stalk, shorter esophagus, cirrus sac not reaching ovary, and a longitudinal groove within the acetabular cavity.

FROM: ALLAN HANCOCK PACIFIC EXPEDITIONS, VOL. 2, NO. 14

Proctoeces progeneticus Dollfus, 1964

Host: Gibbula (Gastropoda, Prosobranchiata)
Locality: Atlantic coast of Morocco



Corps subcylindrique, environ 3 à 5 fois plus long que large, à contour de lagéniforme à cylindriforme en extension sur le vivant ; ovale, allongé au repos, atténué antérieurement, élargi à la fin du deuxième tiers de sa longueur ; extrémités arrondies.

Ventouse orale terminale profonde. Ventouse ventrale plus grande que l'orale, très profonde en vue sagittale ; son centre est situé vers la mi-longueur du corps en extension et vers la fin du premier tiers au repos.

Cuticule non spinulée, lisse ou un peu striée transversalement.

Prépharynx présent, mais observable seulement sur coupes sagittales. Le pharynx est à peu près aussi large que long et un peu rétréci antérieurement. Œsophage court, mais pouvant atteindre en extension la longueur du pharynx. Branches intestinales divergeant un peu en avant du bord antérieur de la ventouse ventrale, s'étendant longitudinalement en direction postérieure, se terminant sans atteindre l'extrémité postérieure du corps.

Testicules plus ou moins ovales, à bord entier, disposés généralement en tandem, parfois presque au même niveau, occupant chacun, en largeur, environ la moitié de l'espace intercaecal, en partie en avant, en partie en arrière de la limite entre les deux derniers tiers de la longueur du corps. Lorsque le testicule antérieur est du côté droit, le postérieur est du côté gauche. Le testicule antérieur, l'ovaire et la poche du cirre sont toujours du même côté. Les *vasa efferentia* se réunissent tout près de l'extrémité postérieure de la poche du cirre.

La poche du cirre, très grande, plus ou moins arquée, est située soit dorsalement, soit latéralement à la ventouse ventrale, tantôt du côté droit, tantôt du côté gauche ; si elle est latérale, elle vient en contact de l'intestin ; antérieurement, elle s'étend jusqu'à la mi-largeur du corps, mais, postérieurement, elle s'étend moins loin vers la ligne médiane. L'extrémité postérieure de la poche du cirre est occupée par la vésicule séminale interne, tubuleuse, formant des sinuosités (1). La *pars prostatica* qui lui fait suite est très développée, elle se continue par le canal éjaculateur qui passe dans le cirre et aboutit à un sinus génital extrêmement réduit. Le cirre proprement dit est très court. Près de l'extrémité du canal éjaculateur se trouve une protubérance musculaire (2) bien développée, pouvant faire saillie dans le très court sinus génital et au dehors par pression sur le vivant (fig. 2-3).

Le pore génital est médian ou submédian, ventralement à la bifurcation de l'intestin, contre le bord antérieur de la ventouse ventrale.

L'ovaire est généralement un peu plus petit que les testicules, sa forme est sphérique ou ovale, à bords entiers ; cependant, chez un de mes exemplaires, l'ovaire était trilobé. Il est situé très peu en arrière de la ventouse ventrale et même il atteint généralement le bord postérieur de celle-ci. Sa position est un peu latérale ou submédiane, du côté droit si la poche du cirre est à droite, du côté gauche si elle est à gauche (*situs inversus*). Il n'y a qu'un très petit espace entre l'ovaire et le testicule antérieur et celui-ci est toujours du même côté que l'ovaire quand ce dernier est un peu latéral.

Il n'y a pas de *receptaculum seminis*, mais il y a un canal de Laurer s'ouvrant dorsalement, presque sur la ligne médiane, au niveau de l'espace entre l'ovaire et le testicule antérieur. L'oviducte reçoit le vitelloducte impair, très court. Le vitelloducte transverse, mal distinct, passe entre l'ovaire et le testicule antérieur. Les follicules vitellogènes sont très petits et très peu nombreux, ils se présentent sous la forme de courtes files

(1) Il ne semble pas y avoir de vésicule séminale externe ; cependant, chez quelques individus, il y a, contre le fond de la poche du cirre, un petit amas de granulations qui peut donner l'impression de représenter une vésicule séminale externe, c'est, apparemment, une petite dilatation du court canal déférent.

(2) Au sujet de cette protubérance musculaire des *Proctoeces* qui a reçu diverses appellations, voir Ts. Fujita (1925, p. 53, fig. 6 « crête fibreuse du pénis »), S. Yamaguti (1934, p. 411, fig. 79 « large muscular nodule », 1938, p. 103), R. F. H. Freeman et J. Llewellyn (1958, p. 442, 443, fig. 1 et pl. I, fig. 3 « muscular papille »).

linéaires transversales dans la zone ovario-testiculaire. Il y a, dans tout le parenchyme du corps, de nombreuses cellules glandulaires qu'il ne faut pas confondre avec des follicules vitellogènes (cf. R. Ph. Dollfus *in* Ts. Fujita 1925, p. 54, note 1).

L'utérus, partant de l'ootype, se dirige d'abord postérieurement, ventralement aux testicules, puis s'étend du côté droit au côté gauche et de la face dorsale à la face ventrale, la branche ascendante croisant la branche descendante. Il remplit presque la totalité du corps en arrière de la ventouse ventrale, jusqu'au pore excréteur.

Les œufs, excessivement nombreux, sont ovales, à petit opercule et mesurent, à maturité, sur le vivant, dans la partie terminale de l'utérus : 49,5 × 29,7 à 51 × 26,4 µ.

Au voisinage du pore génital, on remarque que les œufs sont embryonnés et contiennent un miracidium cilié (3).

(3) Chez les *Proctoeces*, la production d'œufs est souvent abondante et précoce. Chez *maculatus*, dit T. Odhner (1911, p. 108), les individus de 1 mm sont déja remplis d'œufs. Le miracidium mobile dans les œufs a été observé par J. R. Uzmann (1953, p. 449), chez la métacercaire progénétique qu'il a découverte chez *Mytilus edulis* L., de même par R. F. H. Freeman et J. Llewellyn (1958, p. 445, pl. II, fig. 7) chez leur métacercaire progénétique du rein de *Scrobicularia plana* (Da Costa) (1 à 13 métacercaires par hôte).

Toutes les espèces de métacercaires progénétiques n'ont pas de nombreux œufs ; un petit nombre d'œufs seulement a été observé par Ts. Fujita chez sa métacercaire parasite de la gonade d'*Ostrea gigas* Thunberg (1 à 10 métacercaires par hôte).

La vessie excrétrice est en Y. Chez les individus dont le tiers postérieur est en extension, le tronc impair est plus long que les branches et la bifurcation est à peu près au niveau de l'espace intertesticulaire. Les branches se dirigent latéralement puis longitudinalement, ventralement à l'intestin ; elles atteignent le niveau du bord antérieur de la ventouse ventrale, ou même le niveau de l'œsophage.

DIMENSIONS (mm) de trois individus un peu contractés ; montés dans le baume du Canada après coloration :

Longueur	1,541	1,634	1,742
Largeur	0,670	0,804	0,670
Ventouse orale	0,241	0,227	0,174
Pharynx	0,120 × 0,120	0,147 × 0,134	0,134 × 0,134
Œsophage	0,051	0,053	0,027
Ventouse ventrale	0,268 × 0,348	0,268 × 0,348	0,268 × 0,335
Ovaire	0,160 × 0,201	0,201	0,201
Testicule antérieur	0,308 × 0,187	0,174	0,201 × 0,147
Testicule postérieur	0,281 × 0,201	0,214	0,227 × 0,160
Poche du cirre, longueur	0,435	0,316	0,462
diamètre	0,079	0,085	0,06[illegible]

En extension maximum sur le vivant, la longueur peut atteindre 3 mm. Les plus petits immatures mesuraient 0,459 × 0,263 mm.

FROM: DOLLFUS, 1964

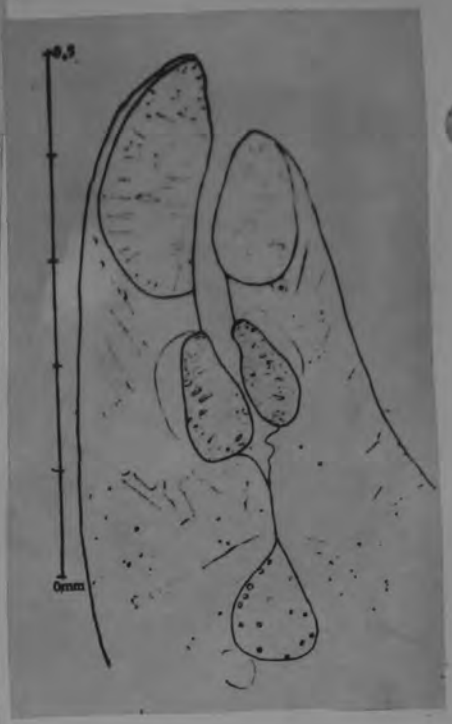
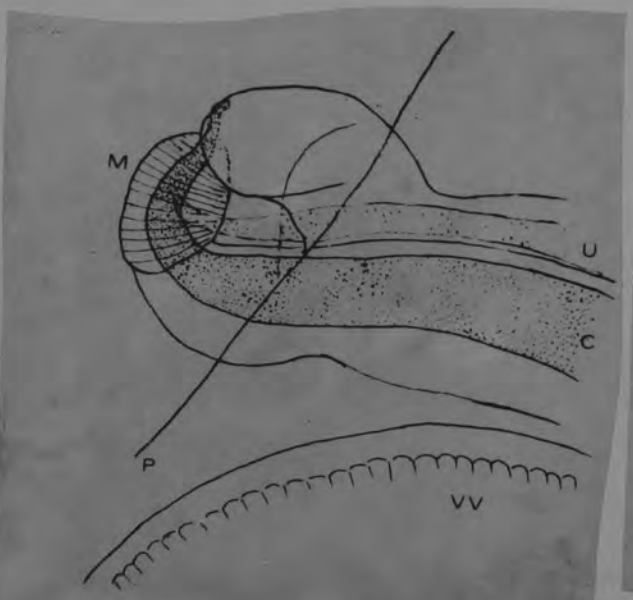


FIG. 4. — Coupe sagittale de l'extrémité antérieure pour montrer l'existence du prépharynx, invisible sur les spécimens vus par les faces



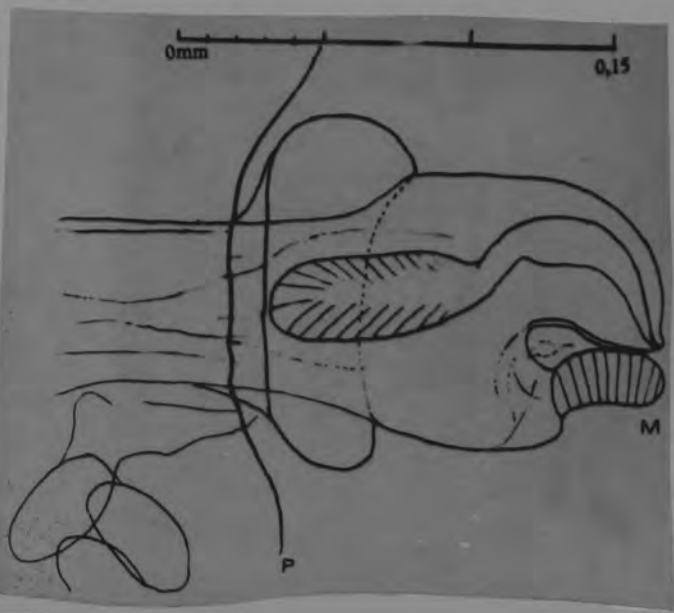


FIG. 3. — Protubérance musculaire du cirre telle qu'elle apparaît chez des individus déprimés elle. M Protubérance musculaire, C canal éjaculateur, U terminaison de l'utérus, V V ventouse ventrale, P paroi du corps

Fellodistomatidae

METACERCAIRE PROGÉNÉTIQUE DE *PROCTOECES* CHEZ UN GASTROPODE PROSOBRANCHE DE LA COTE ATLANTIQUE DU MAROC

SEE
PROCTOECES PROGENETICUS
DOLLFUS, 1964

R. PH. DOLLFUS

Au mois de juin dernier, j'ai disséqué 142 exemplaires de *Gibbula umbilicalis* (DA COSTA, 1778) récoltés à proximité du rivage, à Temara-Gayville (Maroc). Dans 90 % des exemplaires, j'ai trouvé, libre entre la radula et l'intestin, la métacercaire progénétique d'un *Proctoeces*. Il y avait généralement une ou deux métacercaires dans chaque *Gibbula*, exceptionnellement jusqu'à 5; les immatures étaient rares, presque tous les specimens étaient remplis d'oeufs. Les oeufs mûrs de la partie terminale de l'uterus contenaient un miracidium cilié, mobile.

On connait des métacercaires progénétiques de *Proctoeces* chez 4 espèces de Lamellibranches, mais aucune n'avait été trouvée, jusqu'à présent, chez un Gastropode.

Environ 10 espèces ont été décrites dans le genre *Proctoeces*, T. ODHNER, 1911 (incl. *Xenopera*, W. NICOLL, 1915). Quelles espèces doivent tomber en synonymie? Les helminthologistes qui ont examiné la question ne sont pas d'accord.

J'ai comparé mes specimens parasites de *Gibbula* à toutes les espèces décrites et je ne crois pas pouvoir les rapporter à l'une d'elles. Je considère donc mon espèce comme nouvelle et je propose de la nommer *Proctoeces progeneticus* n. sp.; elle est ainsi caractérisée:

Caractères généraux du genre; prépharynx observable seulement sur coupes sagittales; court oesophage; poche du cirre plus longue que le diamètre longitudinal de la ventouse ventrale. Pore génital médian ou submédian, au niveau de la bifurcation intestinale ou contre le bord antérieur de la ventouse ventrale. Sinus génital extrêmement réduit. Ovaire et testicules à peu près de mêmes dimensions, ceux-ci généralement disposés en tandem, rarement tous les deux au même niveau. Ovaire médian ou un peu déplacé vers la droite ou vers la gauche; s'il est vers la gauche, la poche du cirre et le testicule antérieur sont aussi vers la gauche. *Situs inversus* chez environ la moitié des individus. Vitellogène très peu développés. Oeufs extrêmement nombreux; 49,5 × 29,7 à 51 × 26,4 µ. La plupart des specimens sont longs de 1 à 2 mm, le plus long, mesuré sur le vivant, atteignait, en extension, 3 mm; les plus petits immatures mesuraient un peu moins de 1/2 mm.

L'étude de cette métacercaire m'a amené à discuter les affinités du genre *Proctoeces* dans la famille *Fellodistomatidae* (W. NICOLL, 1909; T. ODHNER, 1911). Mon opinion est que, dans une même sous-famille de cette famille, il y a un seul type de cercaire:

les *Steringophorinae* ont une cercaire trichocerque;

les *Fellodistomatinae*, *Tergestiinae* et *Monascinae* une cercaire furcocerque;

les *Rhodotrematinae* une cercaire anoure;

les *Proctoecinae* une cercaire microcerque.

PROC. 1ST INTERNAT. CONGR. PARASIT. 1964

Fellodistomatidae

2. *Proctoeces scrobiculariae* n. sp. Loos-Frank, 1969

Wirt: *Scrobicularia plana* DA COSTA.

Organ: Niere.

Locus typicus: Küste vor Langwarden zwischen Wesermündung und Jade.

Holotypus: in Alkohol fixiertes und mit Gowers Carmin gefärbtes Totalpräparat.

Es handelt sich um die gleiche Art, die FREEMAN und LLEWELLYN (1958) aus dem gleichen Wirt als *P. subtenius* (LINTON, 1907) beschrieben haben, die aber aus Gründen, die in einem der folgenden Kapitel erörtert werden, als selbstständige Art behandelt werden muß. Da die Beschreibung von FREEMAN und LLEWELLYN sehr genau und ausführlich ist, kann sie hier auf das Wesentliche beschränkt werden.

Trematoden von plumpem, im Leben aber sehr dehnbarem Äußeren. Vorderkörper spitz ausgezogen, Hinterkörper breit und dick (Abb. 2a). Tegument unbestachelt und dick. Mundsaugnapf und Pharynx klein. Bauchsaugnapf größer, den Körper so ausbuchtend, daß in Seitenansicht die Form eines flachen, ungleichschenkeligen Dreiecks entsteht (Abb. 2b). Kurzer Präpharynx, nur in Schnitten sichtbar. Darmschenkel breit, nicht bis ans Körper-Hinterende reichend.

Testes rundlich, schräg hintereinander. Cirrusbeutel wie in anderen Arten gebaut. Genitalatrium lang und schmal, Genitalporus auf halbem Weg zwischen Mund- und Bauchsaugnapf, etwas nach links verschoben.

Ovar kugelig, vor den Testes, unmittelbar hinter dem Cirrusbeutel. Laurerscher Kanal und Mehlissche Drüse vorhanden. Uteruswindungen vom Körper-Hinterende bis an den Bauchsaugnapf reichend. Einmündung in das Genitalatrium von ventral, kurz vor dem Cirrusbeutel. Dotterstöcke aus sehr kleinen, 10—50 µ messenden Follikeln bestehend (Abb. 3b), in lateraler Körperregion zwischen Vorderrand des Ovars und Hinterrand des zweiten Hodens, auch nach dorsal und ventral übergreifend. Kleines Dotterreservoir im Leben manchmal sichtbar.

Exkretionsblase mit flachen Zellen ausgekleidet: lange Schenkel und langer Stamm, letzterer mit großer Drüsengruppe am distalen Ende.

Eier mit knöpfchenartig verdicktem Pol. Deckel am anderen Pol nur sichtbar, wenn das Miracidium geschlüpft ist. Miracidien lang bewimpert, schlüpften einige Male ohne mechanische Einwirkung, starben aber bald ab. Nicht embryonierte Eier, z. B. aus Muscheln, die nur einen Wurm enthalten, sind viel schmaler als embryonierte. Eigrößen variieren stark (Abb. 4).

Von den von FREEMAN und LLEWELLYN beschriebenen Exemplaren unterscheiden sich die an der deutschen Küste gefundenen nur durch etwas breitere Eier, die hier 43 × 29 µ messen, dort aber 42 × 24 µ. Auch waren die Muscheln an der ostenglischen Küste zu 100% und mit 4 bis 5 Würmern pro Wirt stärker parasitiert als an der deutschen Küste.

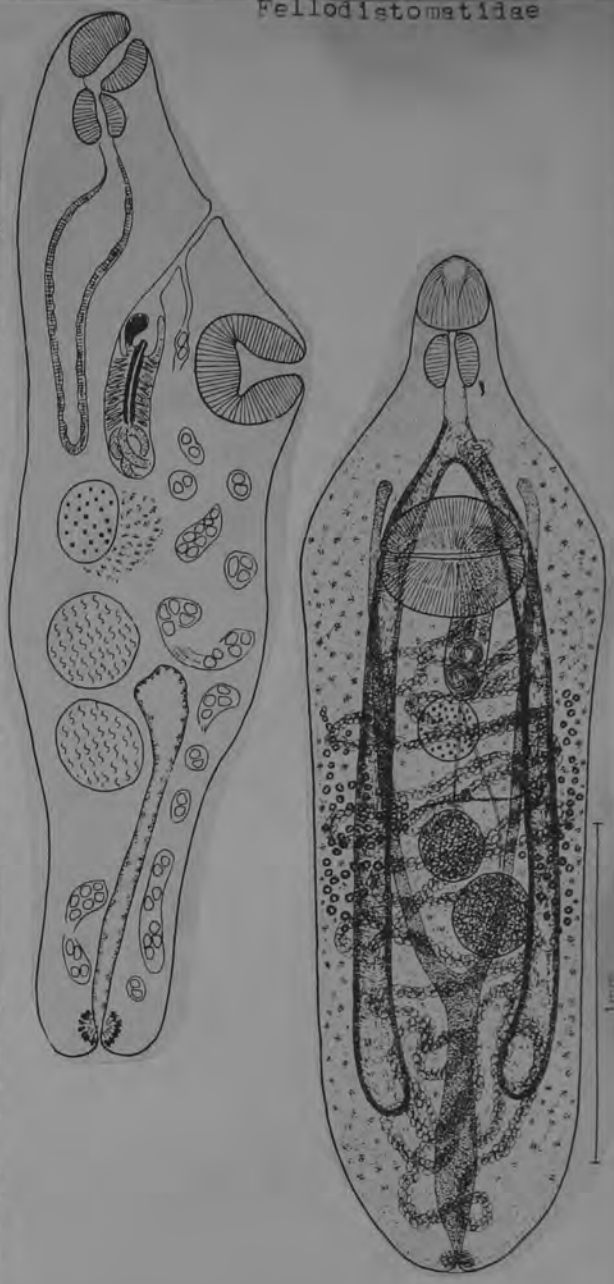


Tabelle 2

	Proctoeces buccini	*Proctoeces scrobiculariae*
Vorderende	breit, abgerundet	zugespitzt
Hinterkörper	schmal	breit
Form des Bauchsaugnapfes	stark vorspringend, Körper in Seitenansicht Y-förmig	wenig hervortretend, Körper in Seitenansicht flach dreieckig
Lage des Bauchsaugnapfes	auf der Grenze von 1. und 2. Körpervierte	auf der Grenze von 1. und 2. Körperdrittel
Stärke der Darmschenkel	100—150 µ	130—200 µ
Ovar	länglich	rund
Dotterstockfollikel	40—80 µ	10—50 µ
Uteruswindungen	zwischen Ovar und Körperende	zwischen Bauchsaugnapf und Körperende
Eimaße	2 Größentypen: 28 × 18 µ, 50 × 29 µ	variabel zwischen 34 × 24 bis 67 × 34 µ

(over)

Tabelle 1. *Maße (in µ, nur Länge in mm) von je 10 fixierten und gepreßten P. buccini* n. sp. *und P. scrobiculariae* n. sp. *In Klammern die Durchschnittswerte*

	P. buccini	*P. scrobiculariae*
Länge	2,1—3,5 (2,8)	2,6—3,5 (3,0)
Breite über Bauchsaugnapf	620—853 (736)	806—1163 (895)
Breite über Testis II	403—698 (591)	682—930 (771)
Mundsaugnapf	224—360 (295)	192—240 (230)
Pharynxlänge	168—248 (221)	160—184 (170)
Pharynxbreite	184—256 (229)	144—178 (162)
Ösophagus	40—80 (53)	96—240 (153)
Bauchsaugnapflänge	376—496 (423)	320—400 (358)
Bauchsaugnapfbreite	440—568 (510)	400—488 (440)
Körpervorderende bis Bauchsaugnapf-Zentr.	612—1184 (792)	744—1080 (893)
Ovarlänge	178—235 (200)	143—216 (192)
Ovarbreite	118—185 (146)	163—200 (181)
Testis I	134—241 (181)	184—248 (206)
Testis II	216—274 (213)	208—320 (241)
Eilängen	26—33 (29) 48—54 (50)	29—67 (43)
Eibreiten	14—22 (18) 26—29 (28)	22—35 (29)

Two Adult Trematodes from North Sea Molluscs: Proctoeces buccini n. sp. *and P. scrobiculariae* n. sp.

Summary. Adult members of the genus *Proctoeces* are known from fishes of tropical and subtropical seas and from some marine molluscs. The latter were usually interpreted as progenetic metacercariae. The present author found adults of a new species, *P. buccini*, in the kidney of the Common Whelk (*Buccinum undatum*) and adults of another species in the kidney of the bivalve *Scobicularia plana*. This last one has already been described by FREEMAN and LLEWELLYN (1958). They referred the species to *P. subtenuis* (LINTON, 1907), a parasite of Bermuda fishes from which, however, it can be distinguished clearly. It is, therefore, considered as a separate species, *P. scrobiculariae*. The new species are compared with each other and with the already known ones.

Both trematodes are interpreted as true adults and not as progenetic metacercariae for they have never been found as natural parasites in fishes of Northern Europe where the main vertebrate hosts of the genus *Proctoeces* (Labrids and Sparids) are lacking. *P. buccini* seems to complete its whole life cycle within the whelk as can be concluded from the large number of worms per snail (up to 180) and the low rate of infection (5 out of 93 whelks). On the other hand only a few specimen of *P. scrobiculariae* are to be found in each bivalve (1—4) whereas the infection rate is high in the host population (62%). This indicates an infection through cercariae shed by an intermediate host.

A Metacercaria of the Genus *Proctoeces* (Fellodistomatidae: Trematoda) from an Abalone, *Haliotis discus hannai*, of Rebun Island, Hokkaido

Takeshi SHIMAZU*

A single metacercaria of the genus *Proctoeces* ODHNER (Fellodistomatidae: Trematoda) from an abalone, *Haliotis discus hannai* INO (Archaeogastropoda: Gastopoda), is described. The metacercaria was found in a new locality in the northern regions of the Sea of Japan and on a new second intermediate host for the genus *Proctoeces*. The abalone was collected along the shores of Funadomari, Rebun Island, Hokkaido. The metacercaria, from between the epipodium and mantle of the host, was unencysted with well developed internal organs but was observed to be not of the progenetic form. Althogh it seemed to be morphologically related to *P. maculatus* (LOOSS) ODHNER or to *P. subtenuis* (LINTON) HANSON, specific identifications did not prove successful because of only a single specimen and its lack of eggs.

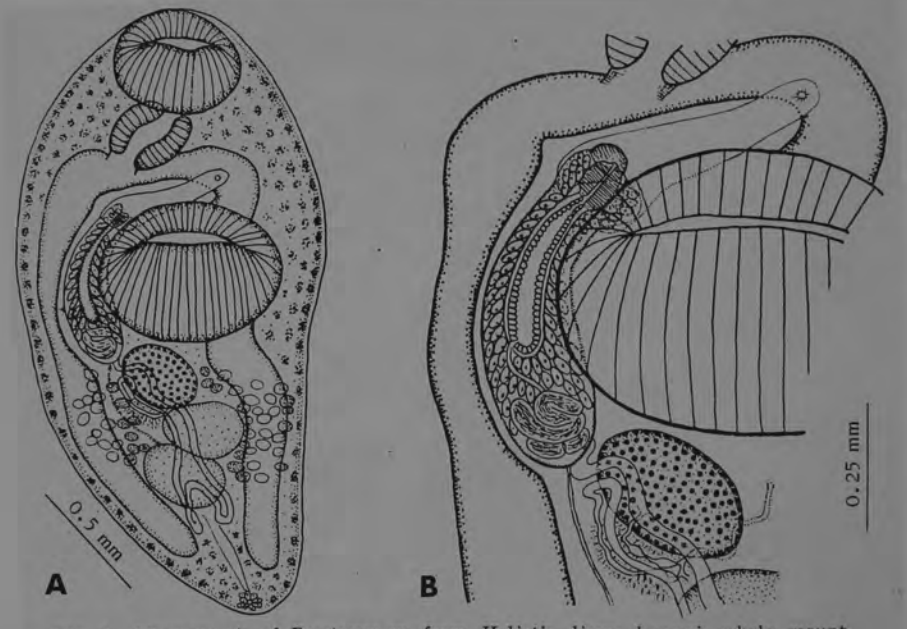


Fig. 1. Metacercaria of *Proctoeces* sp. from *Haliotis discus hannai*, whole mount, ventral view (**A**), and its terminal reproductive organs, ventral view (**B**).

FROM SHIMAZU, 1972

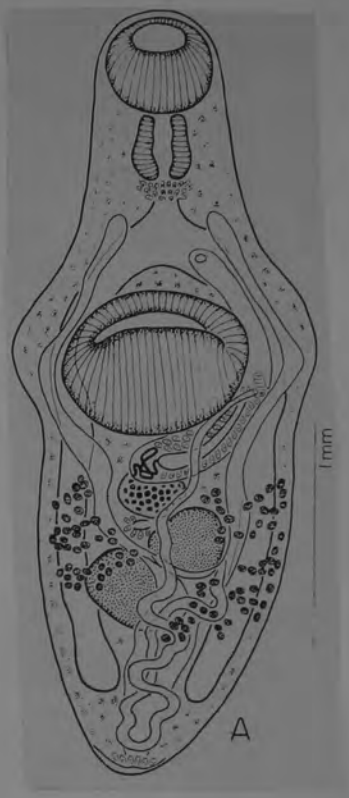
A Metacercaria of a Digenetic Trematode of the Genus *Proctoeces* (Fellodistomidae) Parasitic to the Sea Urchin, *Strongylocentrotus intermedius*

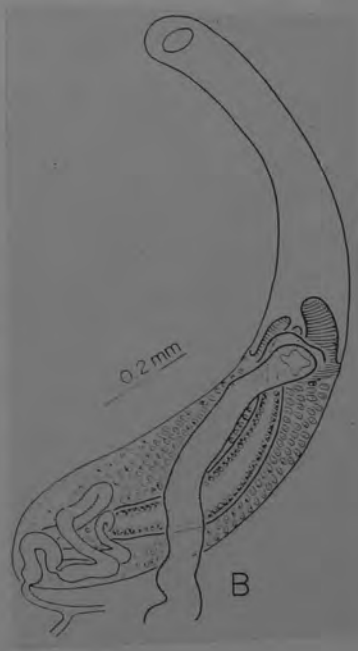
TAKESHI SHIMAZU

Proctoeces sp. Metacercaria

Description. Metacercaria unencysted, not progenetic. Body subcylindrical, elongate, 3.16–3.52 mm long by 0.78–1.07 mm wide at ovarian level. Large gland cells scattered beneath aspinose cuticle throughout body. Oral sucker 0.37–0.43 mm long by 0.43–0.48 mm wide. Prepharynx very short. Pharynx pyriform, 0.33–0.38 mm long by 0.31–0.33 mm wide. Esophagus short, surrounded by small gland cells. Intestinal ceca terminating near posterior end of body. Ventral sucker slightly pre-equatorial, 0.57–0.63 mm long by 0.71–0.80 mm wide; sucker width ratio 1 : 1.54–1.74. Ovary usually subglobular or rarely, trilobed, lying between ventral sucker and anterior testis, median, 0.17–0.27 mm long by 0.24–0.29 mm wide. Ootype-complex immediately postovarian. Laurer's canal present. Seminal receptacle absent. Uterus meandering, passing backward to near end of body, then turning forward, distally forming a simple metraterm opening at base of hermaphroditic duct, which is tubular and long, about 0.5 mm long, and contains cirrus and muscular protuberance at its base. Genital pore slightly to the left of midline of body at intestinal bifurcation. Testes entire, oblique, near middle of hindbody, posterior one usually larger than anterior one, 0.22–0.37 mm long by 0.30–0.48 mm wide. Cirrus pouch club-shaped, extending posteriorly to ovarian level, 0.61–0.72 mm long by 0.18–0.22 mm wide, enclosing coiled tubular seminal vesicle, which is constricted at about proximal one-sixth of total length and provided with a sphincter there, and claviform pars prostatica accompanying prostatic cells. Vas deferens outside cirrus pouch short. Spermatozoa seen in seminal vesicle. Vitelline follicles small, dispersed in ovariotesticular zones, a few of them entering post-testicular space. Excretory vesicle Y-shaped, filled with reddish granular material, divided in testicular region; its two arms reaching esophageal level; pore posteroterminal, encircled by small gland cells; flame cell formula not studied.

The smallest of the flattened whole mounts obtained measured: body 0.95 mm long by 0.26 mm wide; oral sucker 0.16 mm long by 0.18 mm wide; pharynx 0.13 mm long by 0.11 mm wide;





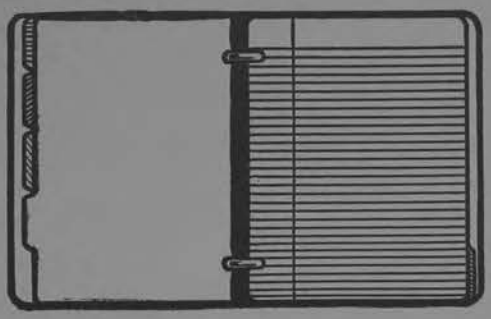
ventral sucker 0.22 mm long by 0.29 mm wide, with sucker width ratio being 1 : 1.61; trilobed ovary 0.01 mm in diameter, and symmetrical testes 0.06 mm in diameter. Vitelline glands were not yet observed in this fluke.

Discussion. This metacercaria belongs to the genus *Proctoeces* Odhner, 1911 (Fellodistomidae). It is morphologically similar to that (NSMT Pl 1911) reported by Shimazu (1972) from the abalone, *Haliotis discus hannai*, of Rebun Island, about 60 km off Wakkanai, in the Sea of Japan. It occurs also in the sea urchin there (Tajima, personal communication). They are presumably the same species. It is impossible at present to identify them to species, because they are sexually immature and lack eggs, the shape and size of which are important diagnostic characters in the genus; and because the taxonomy of the genus has been in a state of confusion (Shimazu, 1972). The specific determination will remain unclarified until gravid adults are available. This is probably the first record of a *Proctoeces* sp. metacercaria from the sea urchin.

Mr. Ken-ichiro Tajima of the Hokkaido Wakkanai Fisheries Experimental Station found a parasite in a sea urchin and sent it to the author for identification. It is described below as a metacercaria of a digenetic trematode of the genus *Proctoeces* Odhner, 1911 (Fellodistomidae).

From Shimazo, 1979

LOOSE LEAF INDEX



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PROCTOR ECES

Genus *PRONOPRYMNA* Poche, 1926

Pentagramma Chulkova, 1939, *nec* Van Duzee, 1897.
Pseudopentagramma Yamaguti, 1971.

DIAGNOSTIC FEATURES. Body small, fusiform. Body-surface smooth. Cirrus-sac elongate; thin-walled; closely applied to surface of seminal vesicle. Seminal vesicle internal; bipartite. Pars prostatica short; surrounded by few gland-cells. Ejaculatory duct short. Cirrus absent as a permanent structure. Ovary median; post-testicular; irregularly trilobed. Laurer's canal opening on dorsal surface close to posterior extremity. Canalicular seminal receptacle present. Vitellarium two symmetrical compact masses composed of small follicles; masses may occasionally be dispersed; lateral or just posterior to ventral sucker. Parasitic in intestine, caeca and (?) stomach of marine teleosts.

TYPE-SPECIES. *Pronoprymna ventricosa* (Rudolphi, 1819) (by original designation).

COMMENT. The name *Pronoprymna* was introduced by Poche (1926) as a replacement name for *Pronopyge* Looss, 1899. Looss (1899) had erected and defined *Pronopyge*, quoting the type as being '*Pronopyge ocreata* (Rud.) (= *Dist. carolinae* Stossich)', and in the definition and a footnote had made it clear that he was using the description of '*Apoblema ocreatum*' by Monticelli (1891), which is clearly of a fellodistomid, in formulating his conception. Monticelli (1891) included not only *D. carolinae*, but also *D. ventricosum* Rudolphi, 1819, as a synonym of his '*Apoblema ocreatum*'. The history of *Distoma ocreatum* is rather involved and will be discussed in more detail elsewhere when discussing *Hemiurus luehei* Odhner, 1905 (Gibson & Bray, in preparation), but its early records are from the stomach and intestine of *Clupea harengus* and Rudolphi (1809), the author of the name, makes it clear that it is an appendiculate (ecsomate) form. Molin (1861) described '*Distoma ocreatum* Rudolphi' from the stomach of *Alosa alosa* at Venice, and then Monticelli (1891) presented his description of '*Apoblema ocreatum*' from the stomach of an 'alose' dissected at Naples. Odhner (1911*b* : 528 footnote) was unable to understand why Monticelli (1891) considered *D. ocreatum* and *D. ventricosum* synonymous, and, on a re-examination of Rudolphi's specimens, declared that *D. ocreatum* of Rudolphi belongs to the genus *Hemiurus* Rudolphi, 1809, and is in fact synonymous with his own species *H. luehei*.

Distoma ventricosa was originally recorded by Rudolphi (1819) from the intestine (p. 108) or stomach (p. 398) of *Alosa alosa* at Rimini. Odhner (1911*b*) also re-examined the types of this species and was convinced that they were a species of '*Pronopyge*'. The type-species of the genus *Pronopyge*, however, was originally designated as *P. ocreata* (Rud.), and, as Article 42(b) of the ICZN makes clear, the genus is 'objectively defined only by reference to its type-species' and that (Article 70) 'it is to be assumed that an author correctly identifies the nominal species that he . . . designates as the type-species of the new or of an established genus'. Poche (1926), anticipating these provisions of the ICZN, produced the new name *Pronoprymna* with the type-species *Distoma ventricosum* Rud., which, it appears, must stand as the valid name of this genus. In short, although Looss' concept of *Pronopyge* is the same as Poche's of *Pronoprymna*, the name *Pronopyge* is objectively based on Rudolphi's *D. ocreatum*, which is now known to be a *Hemiurus* and, therefore, automatically becomes a synonym of the latter genus.

An examination of the description of Molin (1861; as *Distoma ocreatum*) and Monticelli (1891 ; as *Apoblema ocreatum*: Looss' conception of *Pronopyge* is based upon this description), and a comparison with our own material, shows that we are dealing with a fellodistomid genus close to *Bacciger*. It must be more than a coincidence that Rudolphi (1819) described *Distoma ventricosum* and *D. baccigerum* next to one another. It is also apparent that the same species has been figured by van Beneden (1871), who called it *Distoma ventricosa* (p. 68) and *D. ventricosum* (p. 69), and by Stossich (1888, 1889) under the name *Distomum carolinae*. The latter two records are from *Alosa fallax* (= *finta*) off the Belgian coast and Trieste, respectively. The picture of this species that is built up from these various descriptions and figures indicates that it is the same species as was described under the name *Pentagramma symmetricum* by Chulkova (1939) and Margolis & Ching (1965) from shads in the Black Sea and as *Orientophorus caspialosae* by Kurochkin (1964) from shads in the Caspian Sea. The name *Pentagramma carolinae* (Stossich) has been used for specimens from the Black Sea region by Koval *et al.* (1973). *Pentagramma* Chulkova, 1939, is pre-occupied and has been replaced by *Pseudopentagramma* Yamaguti, 1971; but both of these names now become synonyms of *Pronoprymna*.

There appear to be two known valid species of the genus *Pronoprymna*. These are:

(1) *Pronoprymna petrowi* (Layman, 1930) n. comb. [syns. *Monorcheides* (?) *petrowi* Layman, 1930; *Orientophorus petrowi* (Layman) Mamaev, Parukhin, Baeva & Oshmarin, 1959; *Bacciger petrowi* (Layman) Zhukov, 1959; *Pentagramma petrowi* (Layman) Margolis & Ching, 1965; *Pseudopentagramma petrowi* (Layman) Yamaguti, 1971; *Orientophorus sayori* Yamaguti, 1942; *Faustula sayori* (Yamaguti) Yamaguti, 1958]; from various fishes, notably clupeids, from the North Pacific. This species is reviewed by Margolis & Ching (1965). See also p. 259).

(2) *P. ventricosa* (Rudolphi, 1891) Poche, 1926; type-species of the genus (see below).

From BRAY AND GIBSON, 1980

YAMAGUTI, 1958

Pentagramminae ~~n. subfam.~~

Subfamily diagnosis. — Fellodistomidae: Body elongate. Ceca not reaching to posterior extremity. Acetabulum well developed, in anterior half of body. Testes nearly symmetrical, intercecal, postacetabular. Ovary median, posttesticular. Vitellaria compact, symmetrical, entirely or mainly extracecal, anterolateral to testes. Uterus occupying whole hindbody.

Pentagramma Chulkova, 1939

Generic diagnosis. — Fellodistomidae: Body elongate, very small, with dermal gland cells strongly developed along each side of forebody. Oral sucker subterminal, pharynx small, esophagus of moderate length, ceca narrow, terminating some distance short of posterior extremity. Acetabulum a little larger than oral sucker, about one third of body length from anterior extremity. Testes nearly symmetrical, postacetabular, in middle third of body just medial to ceca. Cirrus pouch anterodorsal to acetabulum. Genital pore immediately postbifurcal. Ovary median, postequatorial, posttesticular. Vitellaria compact, approximately reniform, one on each side of body between acetabulum and testes, entirely or mainly extracecal. Uterus occupying entire hindbody; eggs small. Parasitic in marine fishes.

Genotype: *P. symmetrica* Chulkova, 1939 (Pl. 34, Fig. 443) in *Caspialosa caspica;* Russia.

Review of *Pentagramma*

Chulkova (4) proposed *Pentagramma* for three specimens of a trematode from the pyloric caeca of *Alosa kessleri pontica* (Eichwald) (= *Caspialosa pontica*) from the Black Sea, which she named *P. symmetricum*. Further records of this trematode in the type and other hosts from the same area were published by Pogoreltseva (23), Chernyshenko (3), and Nikolaeva (16, 17).

Chulkova assigned *Pentagramma* to the family Steringophoridae (= Fellodistomatidae). On the basis of Chulkova's somewhat incomplete account of *P. symmetricum*, Yamaguti (40) created the subfamily Pentagramminae, containing only *Pentagramma*, within the Fellodistomatidae.

FROM MARGOLIS AND CHING (1965)

EMENDED DIAGNOSIS:

Pentagramma

Fellodistomatidae. Body ovoid to elongate, small, non-spined. Conspicuous dermal glands in forebody. Suckers similar size, either one larger. Oral sucker terminal or subterminal, acetabulum at junction of anterior and middle thirds of body. Prepharynx absent, pharynx small. Esophagus longer than pharynx; caecal fork preacetabular. Caeca extending posteriorly to ovarian level. Genital pore median, behind caecal fork. Cirrus sac indistinct, dorsal, posterodorsal or anterodorsal to acetabulum; thin-walled, adhering closely to bipartite seminal vesicle. Prostatic cells few. Testes symmetrical, immediately postacetabular. Ovary trilobed, posttesticular. Seminal receptacle and Laurer's canal present. Vitellaria two compact masses, lateral, in acetabulotesticular zone. Uterus filling most of hindbody. Eggs small. Excretory vesicle V-shaped or Y-shaped with very short stem, arms reaching to or almost to pharynx. Parasitic in pyloric caeca and intestine of marine fishes.

Type species: *P. symmetricum* Chulkova, 1939.

Other species: *P. petrowi* (Layman, 1930) ~~n. comb.~~ MARGOLIS AND CHING, 1965

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The following characters distinguish *Pentagramma* from *Bacciger* and *Pseudobacciger*.

	Pentagramma	*Bacciger*	*Pseudobacciger*
Cuticle	Non-spinous	Spined	Spined
Cirrus sac	Indistinct, adhering closely to seminal vesicle	Well developed	Absent
Prostatic cells	Few, mainly in anterior end of cirrus sac	Many, fill large portion of cirrus sac	Absent
Ovary	Posttesticular	Intertesticular	Intertesticular and partially posttesticular[2]
Vitellaria	Compact	Clusters of large follicles	Clusters of follicles[2]

FROM MARGOLIS AND CHING (1965)

HOST AND LOCALITY RECORDS OF PENTAGRAMMA SPECIES

Pentagramma symmetricum	*Alosa fallax pontica* (syn. *Caspialosa pontica*)	Black Sea (Batumi)	Chulkova (4)	*P. symmetricum*
	Alosa fallax pontica (syn. *Caspialosa k. pontica*)	" " (Odessa Bay)	Chernyshenko (3)	" "
	" " "	" " (Novorossilsk)	Pogoreltseva (23)	" "
	Alosa caspia nordmanni (syn. *Caspialosa c. nordmanni*)	" " (Odessa Bay)	Chernyshenko (3)	" "
	Alosa kessleri maeotica (syn. *Caspialosa k. maeotica*)	" " (Kerch)	Pogoreltseva (23)	" "
	Clupeonella delicatula	" " (Odessa Bay)	Chernyshenko (3)	" "
	Engraulis encrasicholus maeoticus	" " (Kerch Strait)	Nikolaeva (16)	" "
	Engraulis encrasicholus ponticus	" " (Crimean coast)	Nikolaeva (17)	" "
Pentagramma petrowi	*Osmerus eperlanus dentex*	Sea of Japan (Peter the Great Bay, U.S.S.R.	Layman (10)	*Monorchis(?) petrowi*
	Hemirhamphus sajori	Japan (Tsuchiura, Lake Kasumiga)†	Yamaguti (38)	*Orientophorus sajori*
	Salvelinus malma	Pacific Ocean (Avachin Bay, Kamchatka, U.S.S.R.)	Mamaev *et al.* (11)	*Orientophorus petrowi*
	" "	Bering Sea (Lawrence Bay, Chukotsk Pen., U.S.S.R.)	Zhukov (44)	*Bacciger petrowi*
	Hypomesus olidus	Pacific Ocean (Shikotan Is., Kurile Is., U.S.S.R.)	Zhukov (44)	" "
	Hexagrammos lagocephalus	" " " " "	" "	" "
	Hemitripterus villosus	" " " " "	" "	" "
	Liopsetta obscura	" " " " "	" "	" "
	Clupea pallasi (syn. *C. harengus pallasi*)	Bering Sea (Providence Bay, Chukotsk Pen., U.S.S.R.)	Zhukov (44)	" "
	Clupea pallasi	Pacific Ocean (Vancouver Is., British Columbia)	Present paper	*Pentagramma petrowi*
	Mallotus villosus	" " (Nanaimo, British Columbia)	" "	" "
	Hypomesus pretiosus	" " (Vancouver, British Columbia)	" "	" "
	Spirinchus dilatus	" " " "	" "	" "
	Oncorhynchus gorbuscha	" " (King Cove, Alaska Peninsula)	" "	" "
	Oncorhynchus nerka	Bering Sea (Egegik, Bristol Bay, Alaska)	" "	" "
	Gadus macrocephalus	Pacific Ocean (Kronotski Gulf, Kamchatka, U.S.S.R.)	Skrjabina (30)	*Bacciger petrowi*

*In the text Skrjabin and Koval (29) cited *Atherina hepsetus* as a host of Koval's Black Sea specimens. The caption to one of Koval's figures (Fig. 58a in Skrjabin and Koval) gives the host as *A. pontica*. We presume the citation of *A. hepsetus* as a host of Koval's Black Sea specimens to be a *lapsus* for *A. pontica*.
†Yamaguti (38) used the uncommon spelling "Tuttura" for this city located on Lake Kasumiga (= Kasumiga ura) on the Pacific coast of Japan.

FROM MARGOLIS AND CHING (1965)

The species of *Pentagramma* also have low host specificity. Although the type species, *P. symmetricum*, has been reported from two closely related clupeiform families (Clupeidae represented by *Alosa* and *Clupeonella*, and Engraulidae represented by *Engraulis*), *P. petrowi* has been found in such diverse orders as Clupeiformes (Osmeridae, represented by *Osmerus*, *Hypomesus*, *Mallotus*, and *Spirinchus*; Salmonidae, represented by *Salvelinus* and *Oncorhynchus*; Clupeidae represented by *Clupea*), Beloniformes (*Hemirhamphus*: Hemirhamphidae), Gadiformes (*Gadus*: Gadidae), Perciformes (*Hexagrammos*: Hexagrammidae and *Hemitripterus*: Hemitripteridae), and Pleuronectiformes (*Liopsetta*: Hippoglossidae). Low incidence and intensity of *P. petrowi* in non-clupeiform fishes (30, 43) indicate that such fishes are only of minor importance as definitive hosts of this trematode. The principal hosts appear to be the smaller, pelagic, zooplankton-feeding clupeiforms.

The discontinuous geographical distribution of *Pentagramma* is, indeed, interesting. *Pentagramma symmetricum* is known only from the adjoining Black and Azov Seas, whereas the very closely related *P. petrowi* occurs around the North Pacific rim from about 36° N. latitude on the coast of Japan (Tsuchiura) to about 66° N. latitude on the Bering Sea coast of the U.S.S.R., and southward to about 49° N. latitude on the coast of British Columbia. We know of no other helminth genus with a similar distribution. Perhaps *Pentagramma* occurs in other European and Arctic waters, but has not yet been reported there.

FROM MARGOLIS AND CHING (1965)

Pronoprymna ventricosa (Rudolphi, 1819) Poche, 1926

Distoma ventricosum Rudolphi, 1819.
Apoblema ventricosum (Rudolphi) Monticelli, 1893.
Pronopyge ventricosa (Rudolphi) Odhner, 1911.

Distoma ocreatum (Rudolphi) of Molin (1859; 1861)
Apoblema ocreatum (Rudolphi) of Monticelli (1891).
Pronopyge ocreata (Rudolphi) of Looss (1899).
Distomum carolinae Stossich, 1888.
Pronopyge carolinae (Stossich) Dollfus, 1968.
Pentagramma carolinae (Stossich) Koval, Paschkevitschute, Boschko, Kovalenko & Stavrovsky, 1973.
Pentagramma symmetricum Chulkova, 1939.
Pseudopentagramma symmetricum (Chulkova) Yamaguti, 1971.
Orientophorus caspialosae Kurochkin, 1964.
Pseudopentagramma caspialosae (Kurochkin) Yamaguti, 1971.

TYPE-HOST AND LOCALITY. *Alosa alosa*, Rimini, Italy.

RECORDS

(i) Material studied

(a) From the NE Atlantic

Alosa alosa [pyloric caeca] SW Irish Shelf, Celtic Sea (Dec., 1974). Donated by A. V. Gaevskaja. BM(NH) 1978.2.22.1–2.

Alosa fallax [intestine] River Severn, England (May). Collected by C. R. Kennedy. BM(NH) 1977.10.11.1–20.

—— [?] Scarborough, North Yorkshire, England (Jan., 1978). Collected by D. Whittaker. BM(NH) 1979.2.14.20–22.

(b) From elsewhere

Alosa pontica [?] Black Sea (1968). Studied for us by A. V. Gaevskaja.

Engraulis encrasicolus [pyloric caeca] Black Sea. Collected by V. M. Nikolaeva. Material of L. Margolis.

(ii) NE Atlantic records from the literature

Alosa alosa [intestine] Belgian coast. van Beneden (1871 : 69; as *Distoma ventricosum*, but not figured or described).

—— [stomach, intestine] River Rhine at Basle, Switzerland. Zschokke (1896 : 775; as *Distomum ventricosum*, but not figured or described); Hausmann (1897 : 6, 20; as *D. ventricosum*, but not figured or described).

Alosa fallax [stomach] Belgian coast. van Beneden (1871 : 68; as *Distoma ventricosa*, figured).

Sprattus sprattus [pyloric caeca, intestine] Belgian coast. van Beneden (1871 : 67; as *Distoma ventricosum*, but not figured or described).

ASPECTS OF BIOLOGY. Nothing is known of the life-history of this worm. It appears to be a relatively common parasite of shads (*Alosa* spp.) and occurs less commonly in other fishes, notably other clupeids. It is found in the Mediterranean, Black and Azov Seas, as well as in the NE Atlantic region, and is said to occur in the South Atlantic and Red Sea (Parukhin, 1975).

PREVIOUS DESCRIPTIONS. Molin (1861 : 209; as *Distoma ocreatum*); van Beneden (1871 : plate IV, Fig. 11; as *Distoma ventricosum*); Stossich (1888 : 101; 1889 : 26; as *Distomum carolinae*); Monticelli (1891 : 508, as *Apoblema ocreatum*); Chulkova (1939 : 22; as *Pentagramma symmetricum*); Nikolaeva (1963 : 411; as *P. symmetricum*); Kurochkin (1964 : 166; as *Orientophorus caspialosae*); Margolis & Ching (1965 : 391; as *P. symmetricum*); Naidenova (1970 : 95; as *P. symmetricum*).

DESCRIPTION (Fig. 15). This description is based upon 33 whole-mounted and 7 sectioned specimens. Our observations have been supplemented by measurements and figures of specimens from both the Celtic Sea and Black Sea carried out by Dr Gaevskaja. The worms are small and have a fusiform outline (Fig. 15a & b); the dimensions are given in Table 11. As far as could be ascertained the surface of the body is smooth and does not bear spines. The subterminal, globular *oral sucker* is usually slightly smaller than the globular *ventral sucker*, which is present just inside the anterior half of the worm. There is a short prepharynx, a small, oval *pharynx* and a

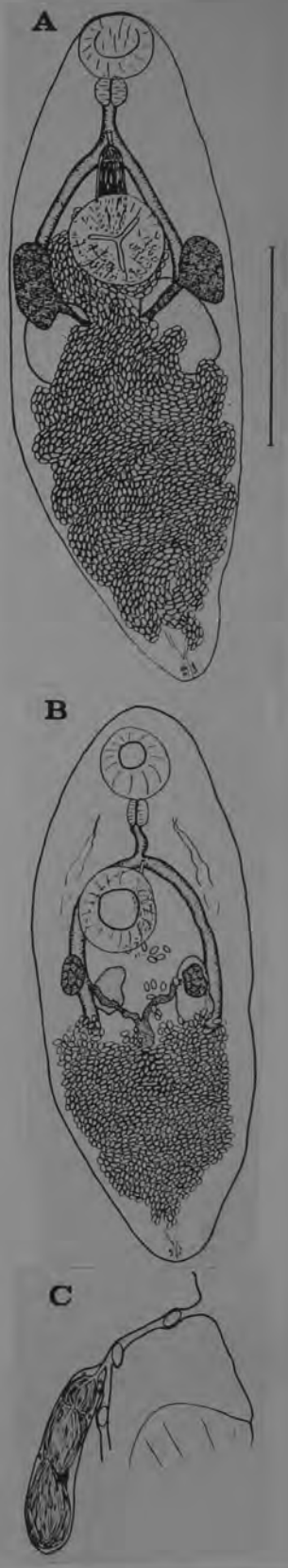

Fig. 15 *Pronoprymna ventricosa*: (a) specimen from Celtic Sea; (b) specimen from River Severn; (c) cirrus-sac; (d) diagram of female proximal genitalia and part of excretory system. Bar scale: a, b = 0·5 mm.

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distinct oesophagus, which is longer than the pharynx. The caecal bifurcation occurs in the posterior forebody, and the narrow caeca reach back dorso-laterally to just beyond the testes where they end blindly.

The *excretory pore* is terminal. It leads into a vesicle which is essentially 'V'-shaped, although it has a short, narrow stem. The arms reach into the forebody to about the level of the oesophagus.

The irregularly oval to globular *testes* lie symmetrically in the anterior half of the hindbody. The vasa efferentia enter the cirrus-sac separately, but close together. The *cirrus-sac* is elongate oval, lying dorsally or dorso-laterally to the ventral sucker. Its thin wall adheres closely to the surface of a large, internal, bipartite seminal vesicle, the posterior part of which is usually the larger (Fig. 15c). The pars prostatica is short, difficult to differentiate, in fact it is almost non-existent, and there are a few external gland-cells. The ejaculatory duct is also short, and we found no evidence that a cirrus is formed, as occurs in *Bacciger*. The ejaculatory duct opens into the base of a long, narrow genital atrium (Fig. 15c); some authors have regarded this as part of the ejaculatory duct. The genital pore opens just anteriorly to the ventral sucker, and is more or less median, although it may be displaced slightly in some specimens.

The *ovary* lies in the median line just posterior to the testes. It is trilobed, although the lobes may be somewhat irregular and the lobation is often not clearly visible in poorly preserved material, or the whole ovary may be obscured by eggs. The short oviduct leaves the ovary ventrally and almost immediately receives Laurer's canal (Fig. 15d) and the common vitelline duct. The proximal region of Laurer's canal is dilated to form a canalicular seminal receptacle posterior to the ovary. It then continues posteriorly dorsal to the uterine field, before opening to the exterior on the dorsal surface close to the posterior extremity. There is no uterine seminal receptacle. The *uterus* fills most of the hindbody posterior to the testes and contains numerous operculate eggs. It is not possible to discern how the uterus coils, but the narrow distal region passes anteriorly between the testes and dorsal or dorsolateral to the ventral sucker, and unites with the ejaculatory duct at the base of the narrow genital atrium (Fig. 15c). The *vitellarium* consists of two symmetrical masses of tightly packed follicles, lying laterally or postero-laterally to the ventral sucker. Occasionally the follicles are dispersed, and more often only on one side: this effect occurs much more frequently in poorly preserved material. The thick main vitelline collecting ducts form a conspicuous 'V'-shaped structure in the middle of the body, the ducts meeting ventrally or antero-ventrally to the ovary to form a distinct vitelline reservoir of variable size (Fig. 15b & d). This reservoir is the dilated common vitelline duct.

Discussion. The description above agrees closely with that of Margolis & Ching (1965) except for the interpretation of the terminal genitalia. The latter authors, when describing *Pentagramma petrowi*, considered that the ejaculatory duct is long and thin, did not apparently detect the union with the uterus at the base of the genital atrium, and thus seem to have confused the ejaculatory duct and the genital atrium. The early descriptions of Monticelli (1891) and Stossich (1889) show minor discrepancies with ours, but we have little doubt that these descriptions refer to the same species. The length of the caeca shown in the figures of these two workers is rather puzzling; but, as in all of our whole-mounts the posterior extent of the caeca is obscured by eggs, it is likely that Monticelli and Stossich misinterpreted these structures. In some of the early descriptions, and in Looss' (1899) definition of *Pronopyge*, a small, button-shaped ecsoma is referred to; but an examination of the figures of Molin (1861) and Monticelli (1891) suggest that this is nothing more than a small protrusion surrounding the excretory pore: such a protrusion is visible in a number of the specimens from the Celtic Sea which we have examined.

Pronoprymna petrowi (Layman, 1930) is similar to *P. ventricosa*. Margolis & Ching (1965) cite three distinguishing features: sucker-ratio, position and shape of oral sucker, and position of seminal vesicle relative to ventral sucker. The combination of these three features, particularly the first two, would appear to constitute, at the present time, sufficient reason for recognizing both species although it is apparent that well-preserved specimens of the two species have not been compared in detail. Margolis & Ching suggested that there is a discontinuous distribution in the genus, with *P. ventricosa* in the Black and Azov Seas and *P. petrowi* in northern Pacific waters. The reports of *P. ventricosa* in the Mediterranean Sea and northeast Atlantic (see above), the Red Sea and South Atlantic (Parukhin, 1975), and of *P. petrowi* in the Black Sea (Naidenova, 1974) and Indian waters (Madhavi, 1975), questionable though some of these records are, decrease the likelihood that geographical isolation actually occurs.

Distoma catervarium Looss, 1896, for which Yamaguti (1971) erected the genus *Walliniella*, from the intestine of *Alosa fallax* at Cairo, is superficially similar to *P. ventricosa* and comes from one of its normal hosts. These parasites were, according to Looss (1896), poorly preserved, and it is possible, therefore, that certain of the features were misinterpreted. The supposedly post-ovarian testes, however, preclude our adding this name to the synonymy of *P. ventricosa*.

continued →

From BRAY and GIBSON, 1980

Pronoprymna ventricosa (Rudolphi, 1819) Poche, 1926 (continued)

Ovotrema pontica Pigulewsky, 1938, from the intestine of *Engraulis encrasicolus* in the Black Sea, is also morphologically similar to *P. ventricosa*. It differs, however, from specimens of *P. ventricosa*, which we have examined from the same host in the Black Sea, in that it apparently possesses a dispersed, follicular vitellarium not extending into the hindbody, a submedian genital pore, and oval ovary and no distinct oesophagus. This species has been discussed on pages 233 and 254.

Table 11 Dimensions of *Pronoprymna ventricosa* from the present material and from the literature

Authority	Margolis & Ching (1965)*	Gaevskaja (in litt.)	Present material	Present material	Present material
Name used	*Pentagramma symmetricum*	*Pentagramma symmetricum*	*Pronoprymna ventricosa*	*Pronoprymna ventricosa*	*Pronoprymna ventricosa*
Host	*Engraulis encrasicolus*	*Alosa pontica*	*Alosa fallax*	*Alosa alosa*	*Alosa fallax*
Locality	Black Sea	Black Sea	River Severn	Celtic Sea	Scarborough
Length (mm)	0·41–0·94	1·02–1·56	1·24–1·80	1·30–1·66	1·3–1·4
Breadth (mm)	0·17–0·32	0·34–0·36	0·40–0·74	0·51–0·67	0·43–0·48
Length : forebody ratio	1 : 0·26–0·31	(1 : 0·30)	1 : 0·24–0·30	1 : 0·25–0·27	1 : 0·25–0·27
Oral sucker (mm)	0·071–0·094; 0·09–0·10 × 0·08–0·10	0·13–0·15 × 0·15–0·16	0·13–0·20 × 0·15–0·17	0·12–0·17 × 0·14–0·18	0·11–0·15 × 0·14–0·16
Ventral sucker (mm)	0·09–0·12; 0·09–0·14 × 0·10–0·12	0·18–0·20 × 0·18–0·20	0·13–0·23 × 0·14–0·24	0·15–0·25 × 0·17–0·23	0·16–0·18 × 0·14–0·20
Sucker-ratio	1 : 1·1–1·25	(1 : 1·5)	1 : 0·9–1·3	1 : 1·02–1·20	1 : 1–1·25
Pharynx (mm)	0·039 × 0·029–0·039	0·059 × 0·051	0·055–0·060 × 0·060–0·077	0·07–0·10 × 0·06–0·07	0·05–0·08 × 0·05–0·06
Oesophagus (mm)	0·026–0·030	0·046–0·059	0·13–0·15	0·10–0·13	0·06–0·07
Cirrus-sac (mm)	–	–	–	0·14–0·23 × 0·05–0·07	0·18–0·25 × 0·05–0·07
Testes (mm)	0·071–0·15 × 0·066–0·11	0·11–0·16 × 0·081–0·12	0·18 0·13–0·15	0·20–0·29 × 0·17–0·21	0·17–0·22 × 0·10–0·17
Ovary (mm)	0·075–0·13; 0·13–0·12	0·16 × 0·12–0·15	–	–	–
Eggs (μm)	20–32 × 14–18	27 × 14	26–33 × 16–18	27–30 × 16–18	23–28 × 16–18

* These data include our measurements of Margolis' material.

FROM BRAY AND GIBSON, 1980

1. *Pentagramma symmetricum* CHULKOVA, 1939

(Figs. 7, 8, 14)

In the original description of the type species Chulkova (4) did not mention a cirrus sac or a seminal receptacle. Examination of specimens collected by Dr. V. M. Nikolaeva from *Engraulis encrasicholus* from the Black Sea revealed that a thin-walled cirrus sac is present. It adheres closely to, and is largely filled by, the bipartite seminal vesicle, and contains a few prostatic cells (Figs. 7, 8). A seminal receptacle lies ventral to the posterior portion of the ovary (Fig. 7).

Nikolaeva (17) briefly described and gave measurements of *P. symmetricum* from *Engraulis encrasicholus ponticus*. Presumably the specimens she sent us are part of the collection on which her measurements were made. As she noted, the specimens from *Engraulis* are somewhat smaller than those recovered from *Alosa* by Chulkova. This size difference undoubtedly accounts for the fact that the ovary in Chulkova's illustration is well separated from the testes, but in the specimens from *Engraulis* it is immediately posttesticular; in fact, the anterior margin of the ovary reaches slightly anterior to the posterior margin of the testes. Chulkova stated that the ovary was irregularly lobed and her illustration indicates three or four lobes. Nikolaeva's (17) description and our own observations (Fig. 7) point to a basically three-lobed ovary.

In Table III a comparison is made of the measurements given by Chulkova (4) and Nikolaeva (17) with our own from the Black Sea specimens from *Engraulis*.

FROM MARGOLIS AND CHING (1965)

TABLE III

Measurements of *Pentagramma symmetricum* (in mm, except eggs in μ)

	Margolis and Ching (present paper)	Chulkova (4)	Nikolaeva (17)
Host	*Engraulis encrasicholus*	*Alosa kessleri pontica* = *Caspialosa pontica*	*E. encrasicholus ponticus*
Locality	Black Sea	Black Sea	Black Sea
Length	0.41–0.92	1.3–1.8	0.56–0.96
Width	0.17–0.29	0.36–0.50	0.24–0.35
Oral sucker	0.071–0.094	0.13–0.16	0.069–0.12 by 0.078–0.087
Pharynx	0.039 by 0.029–0.039	0.06	0.043–0.050 by 0.040
Esophagus	0.026–0.030		0.022–0.11
Ventral sucker	0.090–0.12	0.16–0.20	0.11–0.19 by 0.10–0.14
Sucker ratio	1:1.10–1:1.24		1:1.5–1:1.8
Testes	0.071–0.15 by 0.066–0.11	0.08–0.20 by 0.04–0.16	0.11–0.17 by 0.062–0.14
Ovary	0.075–0.13	0.16–0.48 by 0.15–0.16	0.096–0.17 by 0.071–0.13
Vitellaria	0.091–0.13 by 0.052–0.068	0.08–0.18 by 0.10	0.068–0.15 by 0.046–0.11
Eggs	20–26 by 12–18	29 by 13	23–29 by 12–17

MARGOLIS AND CHING, 1965

2. *Pentagramma petrowi* (LAYMAN, 1930) ~~N. COMB.~~
(Figs. 9–13)

Syn.: *Monorcheides*(?) *petrowi* Layman, 1930, *Orientophorus sayori* Yamaguti, 1942; *Faustula sayori* (Yamaguti, 1942) Yamaguti, 1958; *Orientophorus petrowi* (Layman, 1930) Mamaev *et al.*, 1959; *Bacciger petrowi* (Layman, 1930) Zhukov, 1959.

Review of Taxonomy

This species was initially described by Layman (10) as *Monorcheides*(?) *petrowi* from two specimens from *Osmerus eperlanus dentex* Steindachner caught in Peter the Great Bay on the Japan Sea coast of the U.S.S.R. The assignment to *Monorcheides* was made with reservations and Layman noted that possibly it belonged to a new genus.

Mamaev *et al.* (11) concluded that *M. petrowi* was identical with *Orientophorus sayori* Yamaguti, 1942 which was described from *Hemirhamphus sajori* Temminck and Schlegel from Japan. They recognized that the species was not a member of *Monorcheides* because of the absence of a spined metraterm and the possession of a posttesticular ovary, and transferred it to *Orientophorus* as *O. petrowi* (Layman, 1930). Other reasons for excluding this species from *Monorcheides* are the absence of body spines and of a spined cirrus. The only difference that Mamaev *et al.* could detect between the description and illustration of *M. petrowi* and those of *O. sayori* was the round ovary in the former and the trilobed ovary in the latter. Although immature specimens collected by Mamaev *et al.* from *Salvelinus malma* (Walbaum) from the east coast of the Kamchatka Peninsula of the Far Eastern U.S.S.R. had trilobed ovaries, the lobation in some cases was weakly demarcated, so that the difference was not considered important.

Yamaguti (40) introduced another name for this species when he synonymized *Orientophorus* Srivastava, 1935 with *Faustula* Poche, 1926, which he placed in the Fellodistomatidae.[1] *Orientophorus sayori* became *Faustula sayori* (Yamaguti, 1942) Yamaguti, 1958.

Zhukov (43)[2] transferred *M. petrowi* to *Bacciger* on the basis of his collection from fishes, especially *Hypomesus olidus*, from the vicinity of Shikotan Island, South Kurile Islands. Although Skrjabin and Koval (29) cited Zhukov's transfer from his 1953 thesis, they did not include this species in their review of *Bacciger*. Earlier, Sobolev (31) had retained Layman's species in *Monorcheides*, a wholly untenable decision. Bykhovskaya-Pavlovskaya *et al.* (1) used the binomen *Orientophorus petrowi* (Layman, 1930) and listed *Bacciger petrowi* (Layman, 1930) Zhukov, 1960 as a synonym.

Description of British Columbia Specimens

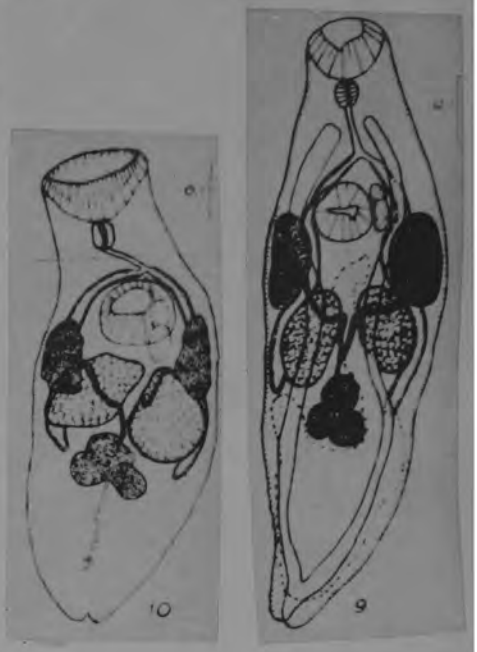
Measurements are based on 20 slightly flattened mature specimens recovered from *Hypomesus pretiosus* (Girard) and *Spirinchus dilatus* Schultz and Chapman, and are in millimeters, except for eggs which are in microns; mean values are in parentheses.

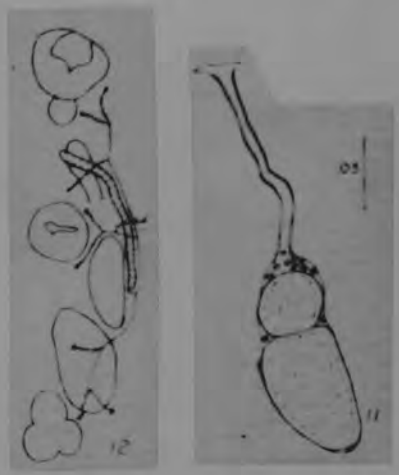
a. General appearance. Body ovoid in small specimens, elongate in larger ones, length 0.63 to 1.45 (1.15). Width at level of gonads 0.19 to 0.54 (0.37). Forebody short, 0.21 to 0.39 (0.30), with numerous gland cells opening at surface. Cuticle thin and delicate, finely wrinkled at anterior end. No spines present.

b. Suckers and digestive system. Oral sucker terminal, weakly muscular, scyphoid, often separated from rest of body by constricted neck region, transverse diameter 0.14 to 0.26 (0.18). Acetabulum at junction of anterior and middle thirds of body, transverse diameter 0.13 to 0.18 (0.16). Ratio of

[1]Skrjabin (28) still recognized the family Faustulidae Poche, 1926, and suprafamilial categories, including a separate order Faustulida, for *Faustula kekxooni* (MacCallum, 1918) Poche, 1926. This action is unwarranted in view of Price's (24) corrections of the original description of *F. kekxooni*.

[2]In this paper *Bacciger petrowi* (Layman, 1930) was stated to be a new combination, but actually it appeared in a publication by the same author (Zhukov (42)) in the previous year.





-OVER-

oral sucker to acetabulum 1:0.71 to 1:1.08 (1:0.87). Pharynx ovoid, 0.048 to 0.078 by 0.039 to 0.058 (0.061 by 0.046). Esophagus length 0.045 to 0.15 (0.080). Caeca terminating past the posterior edge of testes, extending more than half of body length.

c. Reproductive system.—Genital pore immediately anterior to acetabulum, inconspicuous. Cirrus sac, thin-walled, adhering closely to seminal vesicle, difficult to see, best viewed at constriction of vesicle (Fig. 11). Seminal vesicle bipartite, dorsal to acetabulum, may extend beyond its posterior margin, sometimes displaced and slightly anterodorsal to acetabulum. Prostatic cells scarce, near anterior tip of seminal vesicle. Ejaculatory duct long, narrow, delicate (Fig. 11). Testes roughly oval, postacetabular, symmetrical, 0.11 to 0.29 by 0.085 to 0.20 (0.20 by 0.13). Ovary trilobed but may appear irregular in outline depending on angle from which it is viewed, median, slightly posterior to testes, 0.10 to 0.18 by 0.085 to 0.21 (0.14 by 0.13). Seminal receptacle small and pyriform, arising from germiduct ventral to ovary, narrowing to form Laurer's canal posteriorly. Laurer's canal long, winding to posterior end of body, often turning anteriorly before opening dorsally. Vitellaria paired compact masses, mainly extracaecal, in acetabulo-testicular area, not extending anterior to middle of acetabulum, 0.11 to 0.21 by 0.057 to 0.11. Vitelline ducts joining to form common duct. Eggs numerous, completely filling posttesticular area, 23–33 by 13–21; mean size (measured from about 10 eggs) in each of 20 specimens, 26–29 by 14–18. Metraterm thin-walled, uniting with ejaculatory duct at genital pore.

d. Excretory system (Fig. 12).—Excretory bladder with short stem, almost V-shaped, arms extending anterior to caecal fork, may reach pharynx. Initial branches ciliated, flame cell formula from immature specimens, 2[(3 + 3) + (3)].

e. Immature specimens.—Body more often ovoid than elongate. Oral sucker scyphoid, frequently supported by constricted neck region. Acetabulum at mid-body. Gonads occupying posterior half of body, all equal in size. Testes symmetrical; ovary median, trilobed, slightly posterior to testes. Vitellaria compact, not extending anterior to mid-acetabulum. Cirrus sac an ovoid mass containing divided seminal vesicle.

Measurements of *Pentagramma petrowi* (in mm, except eggs in μ)

	Layman (10)	Yamaguti (38)	Mamaev *et al.* (11)	Zhukov (43)	Margolis and Ching (present paper)
Recorded as	*Monorchis(?) petrowi*	*Orientophoma petrowi*	*Orientophoma petrowi*	*Bacciger petrowi*	*P. petrowi*
Host	*Osmerus eperlanus dentex*	*Hemitrimma japonicum*	*Salvelinus malma*	*Hypomesus olidus*	*Hypomesus pretiosus*, *Spirinchus dilatus*
Locality	Sea of Japan	Japan	Kamchatka, U.S.S.R.	Kurile Is., U.S.S.R.	Vancouver, B.C.
Length	0.98	0.57–0.82	0.70–0.75	1.0–2.1	0.63–1.45
Width	0.25	0.21–0.33		0.40–0.66	0.19–0.54
Oral sucker	0.098 by 0.16	0.096–0.20	0.12–0.14	0.13–0.22 by 0.15–0.29	0.14–0.26
Pharynx	0.049	0.049–0.051 by 0.030–0.036	0.040 by 0.050–0.060	0.062–0.080 by 0.046–0.060	0.048–0.078 by 0.039–0.058
Esophagus	0.18	0.050–0.080		0.06–0.12	0.045–0.15
Ventral sucker	0.15	0.086–0.14 by 0.096–0.15	0.10–0.12	0.15–0.22 by 0.19–0.25	0.13–0.18
Sucker ratio					1:0.71–1:1.08
Testes	0.16–0.18 (length)	0.070–0.15 by 0.048–0.12	0.12 by 0.070–0.10	0.19–0.41 by 0.10–0.23	0.11–0.29 by 0.085–0.20
Ovary	0.08	0.080–0.11	0.070–0.080	0.12–0.21 by 0.15–0.21	0.10–0.18 by 0.085–0.21
Vitellaria		0.06–0.14 by 0.038–0.054		0.18–0.29 by 0.066–0.11	0.11–0.21 by 0.057–0.11
Eggs	30 by 14	27–32 by 18–20	None	29–33 by 16–18	23–33 by 13–21

Incidence and intensity of *P. petrowi* in British Columbia fishes

Host	Locality	No. examined	No. infected	Intensity	
				Range	Mean*
Clupeoidea–Clupeidae					
C. pallasi juveniles†	Nanaimo	24	17	1–9	3.7
C. pallasi adults‡	Nanaimo	6	5	1	1
Salmonoidea–Osmeridae					
H. pretiosus	Vancouver	18	17	1–80	12.2
S. dilatus	Vancouver	12	10	1–10	3.0
M. villosus	Nanaimo	9	6	1–4	2.2

*Mean number of specimens per *infected* fish.
†Less than 1 year old.
‡3 and 4 years old.

(CONTINUED NEXT PAGE)

Pentagramma petrowi (Layman, 1930) Margolis and Ching, 1965

(continued from preceding page)

Occurrence in British Columbia and Alaska

In British Columbia *P. petrowi* has been found in *Hypomesus pretiosus*, silver smelt; *Clupea pallasi*, Pacific herring; *Spirinchus dilatus*, long-finned smelt; and *Mallotus villosus* (Müller), capelin. Table IV shows the frequency and intensity of parasitism in these hosts from the Nanaimo and Vancouver areas. Not included in this table because of lack of data are records from juvenile *C. pallasi* from the lower east and west coasts of Vancouver Island.

In Alaska we have found 2 mature specimens in one pink salmon, *Oncorhynchus gorbuscha* (Walbaum), from King Cove, Alaska Peninsula, and 1–23 immature specimens in six sockeye salmon, *Oncorhynchus nerka* (Walbaum), from Bristol Bay. These few records of *P. petrowi* in Pacific salmon resulted from examinations of about 11,000 sockeye and 2000 pink salmon collected throughout the North Pacific region. The low incidence of the parasite in these two salmon species indicates the unimportant role of these fishes as hosts of *P. petrowi*.

In all cases *P. petrowi* was found in the pyloric caeca or intestine.

Discussion

From the foregoing it appears that one and the same species of trematode from fishes taken in waters adjacent to the northwestern North Pacific Ocean has been given several different names. Our specimens from British Columbia also belong to this species. They are identical with the specimens of *Bacciger petrowi* from *Hypomesus olidus* and *Clupea pallasi* (= *C. harengus pallasi*) obtained from Dr. Zhukov. Specimens of *O. sayori* were unavailable for comparison, but Dr. S. Yamaguti examined some of our mounted specimens and found them to agree exactly with his description of *O. sayori*. Yamaguti (38) described minute spines as occurring on *O. sayori*, whereas in our British Columbia material we did not find body spines, but only a fine wrinkling of the cuticle which may give the appearance of delicate spines. We assume that spines are not present on Yamaguti's specimens of *O. sayori*.

Of the various descriptions and illustrations that have been published, only those of *O. sayori* give details of the male terminal genitalia and of the excretory vesicle. Yamaguti (38) described and illustrated a thin-walled cirrus sac closely adhering to a bipartite seminal vesicle and containing a few prostatic cells and a simple ejaculatory duct, as has been observed in our specimens. The excretory vesicle was V-shaped or Y-shaped with a very short stem, and the arms extended forward to the pharynx; this is identical with the condition in the British Columbia material.

The specific name of the species under consideration must be *petrowi* since it takes precedence, by date priority, over *sayori*, but this trematode is not a member of any of the three genera to which it has been assigned. Yamaguti (40), Mamaev *et al.* (11), and Zhukov (43) have already stated that it does not belong to *Monorcheides*. It is not a member of *Faustula* (= *Orientophorus*) because the ovary is basically trilobed instead of multilobed; the seminal vesicle is bipartite rather than tubular and sinuous; the cirrus sac is inconspicuous and contains few prostatic cells instead of being prominent with abundant gland cells; and the vitellaria are compact masses instead of more or less discretely spread follicles. Nor does it belong to *Bacciger* because of the absence of body spines, the possession of an inconspicuous instead of a well-developed cirrus sac containing few rather than abundant prostatic cells, the posttesticular rather than intertesticular ovary, and the vitellaria consisting of two compact masses compared to two clusters of large follicles.

From our studies of specimens of *Pentagramma symmetricum* from the Black Sea, it is evident that *petrowi* should be placed in *Pentagramma* as *P. petrowi* (Layman, 1930) n. comb., with the synonyms as listed above.

FROM MARGOLIS AND CHING (1965)

The seven specimens of *P. symmetricum* which we examined showed the same arrangement and structure of organs as in *P. petrowi* (compare Fig. 7 with Figs. 9 and 10, and Fig. 8 with Fig. 11). However, the two species can be differentiated by the relative sizes of the two suckers, the position and shape of the oral sucker, and possibly the position of the seminal vesicle relative to the acetabulum. In *P. petrowi* (Figs. 9, 10, 13) the oral sucker is terminal, scyphoid, and usually a little larger than the acetabulum (Table V), whereas in *P. symmetricum* (Figs. 7, 14) the oral sucker is subterminal, more or less globular, and smaller than the acetabulum (Table III). The seminal vesicle of *P. petrowi*, as illustrated here and elsewhere under its various synonyms (10, 11, 38, 43), lies dorsal to the acetabulum and frequently extends posterior to it. Only when the cirrus sac of *P. petrowi* has been displaced owing to extreme pressure, does the seminal vesicle reach anterior to the acetabulum. On the other hand, the position of the seminal vesicle in *P. symmetricum* is somewhat more anterior, in that it extends forward of the anterior margin of the acetabulum and posteriorly it terminates well anterior to the posterior margin of the acetabulum. This is evidenced in Fig. 7 and in Chulkova's figure. Nikolaeva (17) stated that the cirrus sac, and consequently the seminal vesicle, in *P. symmetricum* lies in the region of the caecal fork, also implying an anterior position of the seminal vesicle.

Fellodistomatidae

Pentagramma petrowi (Layman, 1930)

syn. Orientophorus sayori Yamaguti,1942

Size 0.57 to 0.82 by 0.21 to 0.33 mm.; truncated anteriorly
Cuticula spined
Oral sucker 0.096 to 0.2 wide
Acetabulum 0.096 to 0.150 wide
Sucker ratio: subequal
Esophagus slender, 50 to 80 u long; ceca running between vitellaria and testes ending slightly behind latter in middle third of body
Testes ovoid, slightly asymmetrical behind acetabulum, ventromedial to ceca.
Cirrus sac from left side of right testis to genital pore, containing a distended seminal vesicle constricted into two unequal portions, a short but distinct pars prostatica, and a simple ductus ejact.
Genital pore median immediately preacetabular.
Ovary divided into three oval lobes, median or slightly to the left at posterior end of middle third.
Seminal rec. retort-shaped, obliquely backward from ovary.
Uterus filling most of posticular space.
Eggs 27 to 32 by 18 to 20 u.
Vitelline follicles small, forming a compact mass, anterolateral to testes, not reaching beyond anterior margin of acetabulum.
Excretory vesicle V- or Y-shaped arms reaching forward to the pharynx.

Host: Hyporhamphus sayori
Japan; Tutiura

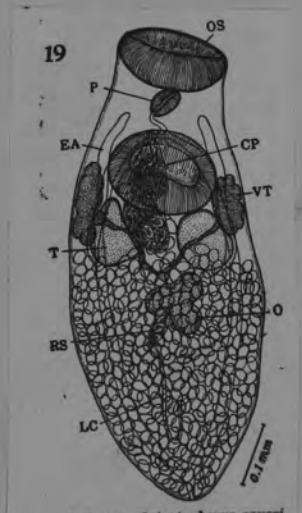


Fig. 19. Orientophorus sayori,

PRONOPRYMNA

Protomonascus gen. n. Fhalin, 1973

Diagnosis

Fellodistomidae: Monascinae. Body elongate, subcylindrical, nonspinous. Oral sucker with longitudinal opening. Prepharynx and esophagus short, intestinal bifurcation preacetabular; ceca two, ending blindly near posterior extremity. Genital pore preacetabular, slightly to left. Cirrus sac pyriform, containing coiled seminal vesicle, numerous prostate gland cells, long tubular pars prostatica, and cirrus. Testes two, diagonal. Ovary lobed, pretesticular, medial or slightly to right. Laurer's canal present. Vitellaria follicular, in lateral fields confined to hindbody, not reaching posterior extremity. Uterus extensive, filling most of hindbody. Excretory vesicle Y-shaped, with arms reaching sides of oral sucker. Parasites of marine fishes. Type and only species:

During January 1972, Professor Orvar Nybelin examined five specimens of the teleost, *Elops senegalensis* Regan, 1909, from the fish market in Bathurst, Gambia. At the openings of the pyloric ceca in three of the fishes, he found one, three, and seven specimens of a digenean, which he presented to the writer for examination. The worms had been fixed in 4% formaldehyde solution and stored in 70% alcohol. Four whole mounts were stained with Mayer's carmalum and two specimens were sectioned and stained with Heidenhain's azan. Figures were drawn with the aid of a camera lucida and measurements are in microns unless otherwise specified.

ABSTRACT: The worms were taken from openings of the pyloric ceca of *Elops senegalensis* collected on the Gambian coast. *Protomonascus* is characterized by an oral sucker with a longitudinal opening, a coiled seminal vesicle, a long pars prostatica, diagonal testes, and a trilobed ovary. The genus resembles *Monascus*, from which it differs primarily in having 2 intestinal ceca ending blindly, the pyriform cirrus sac with coiled seminal vesicle, and the long pars prostatica. The new genus is placed in the subfamily Monascinae within the family Fellodistomidae.

Protomonascus nybelini ~~sp. n.~~ Tholin, 1973
(Figs. 1, 2)

Description (based on 6 specimens)

With characters of the genus. Body tapering posteriorly more than anteriorly, 3.31 to 11.00 mm long by 0.905 to 2.030 mm wide at level between ovary and anterior testis. Oral sucker subterminal, 620 long by 450 wide in largest specimen. Acetabulum spherical, 270 to 320 in diameter, approximately ¼ body length from anterior extremity. Ratio of sucker lengths 1 : 0.44 to 0.53. Prepharynx very short; pharynx 260 to 300 long by 260 to 270 wide; esophagus half length of pharynx, ceca extend almost to posterior end of body. Testes round to oval, smooth, about ⅛ body length from posterior end, anterior testis to left with uterus and excretory vesicle to right. Anterior testis 189 to 380 long by 216 to 380 wide; posterior testis 200 to 410 long by 227 to 420 wide. Vasa efferentia extending anteriad to posterior end of cirrus sac. No vas deferens seen. Cirrus sac overlapping left border of acetabulum, 540 long by 238 wide in largest specimen; posterior third occupied by coiled seminal vesicle; pars prostatica about ½ as long as cirrus sac, followed by short, muscular cirrus; prostate cells numerous, filling most of remaining space in cirrus sac. Genital atrium small. Ovary trilobed, slightly smaller than testes, pretesticular, medial or to right, just posterior to body midlevel. Laurer's canal and well-developed Mehlis' gland immediately preovarian and slightly to left. Uterus fills intercecal space from level of acetabulum to posterior end of body. Metraterm ascending outside along posteroventral side of cirrus sac, opening into genital atrium immediately posterior to cirrus opening. Vitelline follicles in lateral fields from posterior margin of acetabulum to region of testes. Vitelline reservoir preovarian. Eggs numerous, oval, yellowish-brown, 47 to 54 by 20 to 25. Excretory vesicle with stem dividing between testes and ovary; arms crossing ceca in acetabular region, each dividing slightly posterior to intestinal bifurcation to form a ventral branch ending blindly at midlevel of oral sucker and a dorsal one ending blindly at anterior extremity of body.

Host: Ten-pounder, *Elops senegalensis* Regan, 1909.

Habitat: Intestine at openings of pyloric ceca.

Locality: Coast of Gambia, West Africa.

Type specimens: Deposited in Natural History Museum, Gothenburg, Sweden: Trem. 1486–1492.

DISCUSSION

Protomonascus nybelini has the characters of the family Fellodistomidae. The longitudinal opening of the oral sucker and the distribution of the vitelline follicles suggest a close relationship to the genus *Monascus* Looss, 1907. However, it differs from this genus in having two intestinal ceca, a pyriform cirrus sac with coiled seminal vesicle, a long pars prostatica, and a trilobed ovary. Other main differences are the diagonally situated testes, the anterior branching of the excretory canals, the la[illegible] body, and longer eggs.

The ceca ending blindly near the poster[illegible] end of *P. nybelini* may indicate that *Pr[illegible] monascus* is a more primitive genus t[illegible] *Monascus* with a single cecum opening in[illegible] the excretory vesicle near the excretory por[illegible] One species, *M. notoi* Travassos, Freitas, an[illegible] Bulrnheim, 1965, has a lobed ovary as in *P. nybelini*, but the remaining four species o[illegible] *Monascus* have oval or spherical ovaries.

Travassos et al. (1965) proposed the famil[illegible] Monascidae with one subfamily Monascina[illegible] Dollfus, 1947, and *Monascus* as the only genus[illegible] However, the new genus *Protomonascus* ma[illegible] make the status of Monascidae questionable[illegible] The main argument not to place *Protomonascu[illegible]* in the subfamily Monascinae according t[illegible] Yamaguti's (1958) diagnosis is the difference[illegible] in the digestive system. The author's opinio[illegible] is that a subfamily could contain two gener[illegible] with differences in the digestive system an[illegible] the proposal of a new subfamily at presen[illegible] does not seem to be warranted. *Protomonascu[illegible] nybelini* gen. et sp. n. is included in the sub[illegible] family Monascinae within the still valid family[illegible] Fellodistomidae.

The name *Protomonascus* (*protos*: first[illegible] before; *monascus*: one cecum) reflects th[illegible] author's opinion that the new genus is mos[illegible] closely related to *Monascus*, but is less modi[illegible] fied, retaining the two ceca characteristic o[illegible] other Fellodistomidae. The specific nam[illegible] *nybelini* is given in honor of Professor Orva[illegible] Nybelin of the Natural History Museum, Goth[illegible] enburg, Sweden. I am indebted to him fo[illegible] donating the specimens and for his advice[illegible] during this investigation, and to Dr. Ken Mac[illegible] Kenzie, Marine Laboratory, Aberdeen, Scot[illegible] land, for help with the English.

PROTOMODASCUS

Genus *PRUDHOEUS* ~~gen. nov.~~ BRAY AND GIBSON, 1980

DEFINITION. Body small, elongate oval. Body-surface smooth. Oral sucker globular; subterminal. Ventral sucker transversely oval; much larger than oral sucker; inside anterior half of body. Hindbody longer in mature specimens than in immature worms. Prepharynx small. Pharynx oval, well developed. Oesophagus short. Intestinal bifurcation near middle of forebody; caeca end blindly close to posterior extremity. Testes two; irregularly rounded to oval; more or less symmetrical in anterior hindbody; post-ovarian. Cirrus-sac oval; containing bipartite seminal vesicle, wide pars prostatica with external gland-cells and filamentous lining, and well-developed ejaculatory duct [wide and diverticulate in other members of subfamily]. Well-developed cirrus often present. Genital atrium present; shallow. Genital pore ventrally submedian, sinistral; at about level of intestinal bifurcation; may be wide when cirrus everted. Spermatophores may be present. Ovary trilobed; anterior to right testis or approximately median. Laurer's canal and uterine seminal receptacle present. Uterus mainly post-testicular; reaches to posterior extremity. Eggs small; operculate; without spines, filaments or ornamentation on shell. Vitellarium follicular; in two lateral fields; mainly in ventro-lateral plane; between the level of the posterior margin of ventral sucker and a level posterior to the middle of the hindbody; fields may almost unite ventrally. Excretory pore terminal; vesicle 'V'-shaped, with arms reaching into forebody. Parasitic in upper intestine of marine teleosts.

TYPE-SPECIES. *Prudhoeus nicholsi* sp. nov.

COMMENT. This new genus is probably most closely related to *Lomasoma* Manter, 1935, and *Lissoloma* Manter, 1934. It differs from the former in lacking any lateral lobation of the body, from the latter in body-shape, and from both in possessing a trilobed, rather than a multilobate, ovary, in lacking polar processes or filaments on the eggs and in having much of the vitellarium in the ventral plane.

This genus is named in honour of our colleague Mr S. Prudhoe OBE for contributions to helminth-taxonomy and the years of advice from which we have benefited.

Prudhoeus nicholsi ~~sp. nov.~~ BRAY AND GIBSON, 1980

TYPE-HOST AND LOCALITY. *Polyacanthonotus rissoanus*, off W of Ireland (55°N, 10°W).

RECORDS

(i) Material studied

(a) From the NE Atlantic

Polyacanthonotus rissoanus [upper intestine] Off St Kilda, Scotland (57°N, 09°W; depth 980–1030 m; June, 1974). BM(NH) (paratype) 1977.6.14.366.

—— [upper intestine] W of Tory Island, off W of Ireland (55°N, 10°W; depth 800–825 m; June, 1974). BM(NH) (holotype) 1977.6.14.365; (paratypes) 1977.6.14.367.

—— [intestine] Flannan region, NW of Scotland (58°N, 10°W; depth 1300–1320 m; Oct., 1978). BM(NH) 1979.2.14.7–11 (paratypes).

ASPECTS OF BIOLOGY. According to Wheeler, in Hureau & Monod (1973), *Polyacanthonotus rissoanus*, the host of this species, is benthic, occurring in deep waters of the Mediterranean and eastern Atlantic off Morocco. Our observations indicate that this fish also occurs on the edge of the continental shelf further to the north. It appears that, like *Steringophorus pritchardae* and *Olssonium turneri*, this species is a deep-water form. It appears that spermatophores are used in sperm-transfer.

PREVIOUS DESCRIPTIONS. None.

DESCRIPTION (Fig. 13). Fifteen worms were found, two of which were serially sectioned. Three of the worms are in an early mature condition (Fig. 13b). The larger adult worms are elongate oval, and it is apparent that the hindbody increases in size relative to the forebody at a much faster rate as the worm grows (cf. Figs 13a & b). The body-surface is smooth, and the subtegumentary parenchyma contains many gland-cells. The body-length varies between 1·24 and 2·90 mm and the maximum width between 0·37 and 0·86 mm. The forebody, which tapers sharply, is less than a quarter (0·17–0·22) of the body-length in the largest specimens, but a much greater proportion (0·26–0·37) of the body-length in the smaller specimens. The hindbody, when filled with the voluminous uterus, has roughly parallel sides with a rounded or slightly indented posterior margin, but in the smallest specimen it is broadly oval. The subglobular, subterminal *oral sucker* (0·11–0·20 × 0·10–0·17 mm) is smaller than the transversely oval *ventral sucker* (0·23–0·40 × 0·26–0·43), the ratio being 1 : 2·3–3·7. The aperture of the ventral sucker may be directed anteriorly. There is a very short prepharynx, which leads into a globular *pharynx*, measuring about 0·064–0·09 mm in diameter. The short oesophagus (0·05–0·10 mm in length) bifurcates at about the middle of the forebody, and the caeca, which are narrow and straight, reach into the posterior half of the post-testicular zone, where they end blindly.

The *excretory pore* is terminal and leads into a short, narrow glandular duct which leads into a 'V'-shaped vesicle. The arms reach dorso-laterally into the forebody to the level of the cirrus-sac.

The irregularly rounded to oval *testes* (0·16–0·29 × 0·08–0·19 mm) lie symmetrically or slightly obliquely in the anterior hindbody. The vasa efferentia pass close together, but separately through the wall of the cirrus-sac. The *cirrus-sac* (0·16–0·24 × 0·12–0·20 mm) lies in the posterior forebody, slightly overlapping dorsally the anterior margin of the ventral sucker. It is globular to oval, and contains a bipartite seminal vesicle, a wide pars prostatica with external gland-cells and filamentous lining and an ejaculatory duct. The proximal region of the seminal vesicle is globular and the distal region is oval. In two of our specimens, including the sectioned specimen, the cirrus is everted, thus modifying the normal arrangement of the contents of the cirrus-sac. The pars prostatica is typical of the subfamily, but in the everted specimens it is pushed forward into the cirrus (Fig. 13c): this movement may also be partly responsible for the elongate oval shape of the distal part of the seminal vesicle. The ejaculatory duct of the everted specimens forms the outer wall of the cirrus. When the cirrus is withdrawn the ejaculatory duct is wide and diverticulate, as it is in other fellodistomines. When everted the cirrus is a large conical structure which extends through the genital pore. In the sectioned specimen a spermatophore can be seen lying close to the end of the cirrus. The genital atrium appears to be shallow, although like the genital pore, which is situated just to the left of the median line at about the level of the intestinal bifurcation, it appears to be wide when the cirrus is everted.

The trilobed *ovary* (0·16–0·26 × 0·13–0·24 mm) lies antero-medially to the right testis, or in the median line, close to the posterior margin of the ventral sucker. The short oviduct passes antero-ventrally from the ovary to Mehlis' gland. Prior to its entry into Mehlis' gland it receives Laurer's canal and the common vitelline duct (Fig. 13d). Laurer's canal passes over the posterior surface of the ovary and opens dorsally at the level of the testes. A uterine seminal receptacle is present, formed by the initial loops of the *uterus*, the majority of which is coiled in the post-testicular zone.

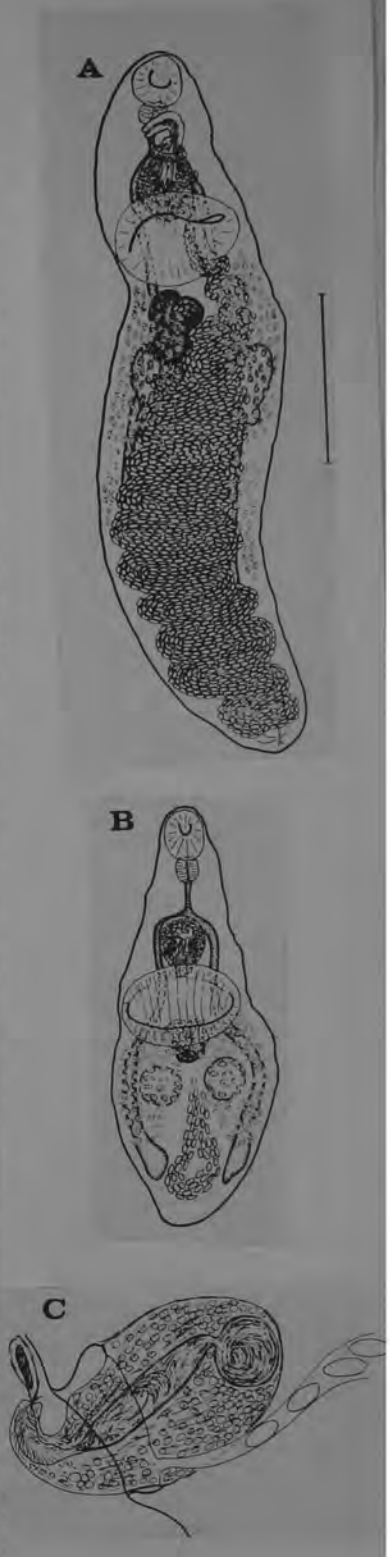


Fig. 13 *Prudhoeus nicholsi*: (a) large specimen, ventral view; (b) small specimen, ventral view; (c) cirrus-sac; (d) diagram of female proximal genitalia. Bar scale: a, b = 0·5 mm.

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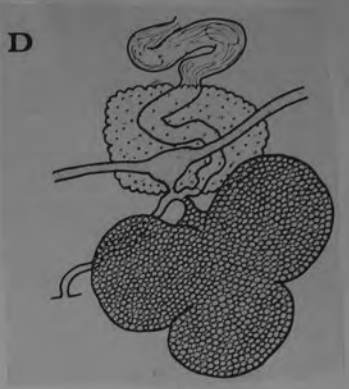
The loops of the uterus extend from the posterior end of the body forward through the intertesticular region to the level of the ovary and a single uterine sling reaches anteriorly towards the genital atrium into which it opens to the left of the cirrus-sac. The numerous, operculate eggs (36–44 × 21–25 μm) lack spines, filaments or ornamentation on the shells. The *vitellarium* is follicular, lying in two lateral fields reaching from the level of the posterior margin of the ventral sucker to just inside the posterior half of the hindbody. The follicles lie mainly in the ventral parenchyma, but pass laterally to the caeca and just into the dorsal field. In the anterior region of the hindbody the vitelline fields come close together ventrally as they are wider in this region. The main lateral vitelline ducts unite ventrally to Mehlis' gland to form the common vitelline duct, which is enlarged proximally to form a distinct vitelline reservoir.



Discussion. Probably the most similar species to *P. nicholsi* in our region is *Steringophorus furciger*. The two can, however, easily be distinguished by the shape of the excretory vesicle, the shape of the ovary, the length of the caeca and the distribution of the vitellarium. This species is also similar to *Steringotrema* sp. of Armstrong (1974) from the macrourid *Ventrifossa atlantica* in the eastern Gulf of Mexico. The sucker-ratio of this unnamed species is smaller ['1 : 1·8–2·2 (2·8 in one specimen)']. The supposed claviform nature of the seminal vesicle and the absence of Laurer's canal also serve to differentiate it from *P. nicholsi*.

This species is named in honour of Mr John H. Nichols of the MAFF Laboratory, Lowestoft, for his help to one of us (R. A. B.) on numerous occasions.

PRUDHOEUS

Pseudobacciger ~~n.g.~~ NAHHAS AND CABLE, 1964

Diagnosis: Fellodistomatidae. Body short; cuticle spinose; eye-spot pigment absent; distomate, ventral sucker in anterior half of body. Pharynx and esophagus present; ceca not extending to posterior end of body. Testes 2, symmetrical, postacetabular; cirrus sac absent. Ovary intertesticular; seminal receptacle present; uterus chiefly posttesticular. Vitellaria compact, lateral masses in acetabular region. Eggs small. Excretory vesicle V-shaped. Parasites in intestine and ceca of marine fishes. Type species: *Pseudobacciger harengulae* (Yamaguti, 1938) n.comb.; (Synonym: *Bacciger harengulae*). other species: *Pseudobacciger manteri* n.sp.

The systematic position of species assigned to the genus Bacciger is confused by the absence of a distinct cirrus in *B. harengulae* which led Yamaguti (1958) to assign that genus to the family Cryptogonimidae. He stated that a cirrus sac is absent because Stossich did not show that structure in *B. bacciger* even though both Nicoll (1914) and Palombi (1934) clearly described a cirrus sac in species in *Bacciger*. We have found a well-developed cirrus sac in a species from *Opisthonema oglinum* but it is absent in another from *Sardinella macrophthalmus*. Evidently the two cannot be assigned to the same genus and therefore we restrict to the genus *Bacciger* those species having a cirrus sac and erect a new genus as (follows) for those in which it is absent:
above

[1]In their diagnosis of *Pseudobacciger*, Nahhas and Cable (14) described the ovary as intertesticular and the vitellaria as compact, lateral masses. However, the published illustrations of *P. harengulae* and *P. manteri* indicate that a large portion of the ovary lies posterior to the level of the posterior margin of the testes, and that the vitellaria consist of two lateral clusters of discrete follicles.

FROM MARGOLIS AND CHING (1965)

~~Heterophyidae~~ Fellodistomatidae

Pseudobacciger ~~Bacciger~~ harengulae (Yamaguti, 1938) Nahhas & Cable, 1964

Length: 0.4-0.63 mm Covered with minute spines
Width: 0.2-0.5 mm at middle
Oral sucker: 60-84μ in diameter
Acetabulum: 58-85μ in diameter
Sucker ratio: Equal
Location acetabulum: Just in front of middle of body
Prepharynx: Absent
Esophagus: Narrow, 0.04-0.12 mm long
Location genital pore: At intestinal bifurcation

Position testes: Just behind middle of body and mediodorsal to cecal ends
Ovary: Median, between and a little behind testes
Eggs: 21-29μ long X 15-19μ broad. Oval, light brown, thick-shelled, containing segmented ovum
Other features: "No distinct cirrus pac"

Host: Harengula zunasi Bleeker

Locality: Lake Hamana and Sea of Ariake, Kyusyu, Japan
References: Studies on Helminth fauna of Japan. Part 21. Kyoto, Japan
Related species: B. bacciger (Rud.)

near Antorchis

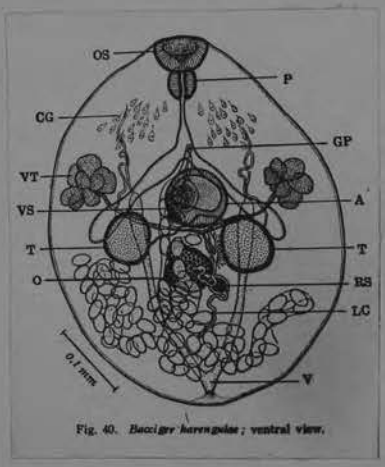


Fig. 40. *Bacciger harengulae*; ventral view.

Ovary indented, distinctly trilobate in immature individuals
Excretory vesicle V-shaped
Vitellaria of 5 or 6 large follicles on each side.

– OVER –

R. G.

Bacciger harengulae Yamaguti, 1938

Host.—*Harengula clupeola* (Cuvier), big-eyed sardine.

Location.—Pyloric ceca.

Locality.—Off Lerner Laboratory pier, N. Bimini, B.W.I. [new locality record]; other localities are Tortugas, Florida, and Japan.

Discussion.—There were usually two *B. harengulae* per cecum. The worms were usually located in the middle of the cecum and were separated from each other by at least one body length. The worms were easily observed *in situ* as the host's ceca were almost transparent.

Sogandares, 1959

4. *Bacciger harengulae* YAMAGUTI, 1938; *B. harengulae* OF MANTER, 1947; *B. harengulae* OF SOGANDARES-BERNAL, 1959

These are all synonyms of *Pseudobacciger* species. Nahhas and Cable (14) transferred *B. harengulae* Yamaguti, 1938 to their new genus *Pseudobacciger*, the species becoming *P. harengulae* (Yamaguti, 1938). *Pseudobacciger manteri* Nahhas and Cable, 1964 (= "*Bacciger harengulae*" of Manter) was separated from *P. harengulae* on the basis of "consistently longer caeca and arms of the bladder extending farther anteriorly." Another difference appears to lie in the posterior lobe of the seminal vesicle being the smaller of the two lobes in *P. harengulae*, but the larger of the two in *P. manteri*. Manter's (12) Fig. 79 clearly shows a much larger posterior lobe and in the specimen of Manter's "*B. harengulae*" which we examined the posterior lobe is bent dorsally and is decidedly larger than the anterior lobe.

Bacciger harengulae was recorded but not described or illustrated by Sogandares-Bernal (32) from *Harengula clupeola* from Bimini, but on the basis of host and locality his specimens also should be considered as *P. manteri*.

FROM MARGOLIS AND CHING (1965)

Pseudobacciger n.g. Nahhas & Cable 1964

Diagnosis: Fellodistomatidae. Body short; cuticle spinose; eye-spot pigment absent; distomate, ventral sucker in anterior half of body. Pharynx and esophagus present; ceca not extending to posterior end of body. Testes 2, symmetrical, postacetabular; cirrus sac absent. Ovary intertesticular; seminal receptacle present; uterus chiefly posttesticular. Vitellaria compact, lateral masses in acetabular region. Eggs small. Excretory vesicle V-shaped. Parasites in intestine and ceca of marine fishes. Type species: *Pseudobacciger harengulae* (Yamaguti, 1938) n.comb.; (Synonym: *Bacciger harengulae*). other species: *Pseudobacciger manteri* n.sp.

Pseudobacciger manteri n.g., n.sp.
Figure 8 Nahhas & Cable, 1964

Synonym: ***Bacciger harengulae* of Manter, 1947, nec Yamaguti, 1938.

Host: Sardinella macrophthalmus (J).

Site: ceca.

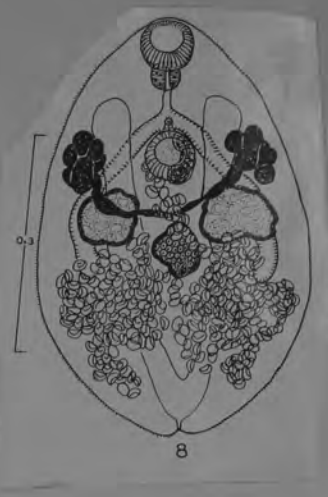
Holotype: U.S.N.M. 60256.

Description based on 20 specimens. Body oval to pyriform, 0.373-0.747 long, 0.266-0.420 wide. Entire cuticle spinose. Oral sucker terminal, 0.045-0.068 in diameter; ventral sucker preequatorial, 0.057-0.090 in diameter; sucker ratio 1:1-1.3. Prepharynx not evident; pharynx 0.033-0.045 in diameter; esophagus 1-2 times length of pharynx; ceca extending a short distance posterior to testes. Testes 2, equatorial to somewhat preequatorial, symmetrical, 0.060-0.090 long, 0.065-0.105 wide; cirrus sac absent; seminal vesicle indistinctly bipartite, extending slightly posterior to ventral sucker; pars prostatica indistinct. Ovary irregular to lobed, 0.060-0.090 in diameter, intertesticular, median, at about posterior level of testes; seminal receptacle small, overlapping ovary or not; uterus chiefly posttesticular; metraterm simple. Genital atrium small; genital pore median, near intestinal bifurcation. Vitelline follicles in 2 largely extracecal groups of 7-10 each at about level of ventral sucker. Eggs 21-24 by 15-20 μ. Excretory vesicle V-shaped, with arms passing ventral to ceca, to terminate at esophageal level; excretory pore terminal.

Manter (1947) reported this species as *Bacciger harengulae* Yamaguti, 1938, from 3 specimens of which one was partly crushed. He noted its resemblance to Yamaguti's material but indicated that it differed in having more rounded eggs and somewhat longer ceca; he was unable to see the excretory vesicle. Measurements given by Yamaguti overlap those of the present species which has consistently longer ceca and arms of the bladder extending farther anteriorly than in the Japanese species.

The next species is named with hesitation because it may be the one that Price (1934) described as *Steringotrema ovata* from a single specimen. Both occur in the same host species and agree in all respects except the topography of the gonads. Price's specimen was examined but it was faded and the gonads were so indistinct that their identity and arrangement could not be determined with certainty.

Fellodistomatidae



LOOSE LEAF
ORGANIZER

SCHEDULE

PERIOD OR TIME								
COURSE **MON.** INSTRUCTOR								
COURSE **TUE.** INSTRUCTOR								
COURSE **WED.** INSTRUCTOR								
COURSE **THU.** INSTRUCTOR								
COURSE **FRI.** INSTRUCTOR								
COURSE **SAT.** INSTRUCTOR								

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Pseudosteringophorus Yamaguti, 1940

Generic diagnosis. — Fellodistomidae, Fellodistominae: Body small, fusiform, unarmed. Acetabulum in middle region of body. Oral sucker terminal, with longitudinally elongated aperture on ventral side. Pharynx small, esophagus moderately long, ceca half long, not extending back of acetabulum. Testes symmetrical, postacetabular. Cirrus pouch pre-acetabular, strongly muscular, containing bipartite seminal vesicle and well developed prostatic complex. Cirrus projecting into genital atrium. Latter muscular, provided at base with a saccular outgrowth lined with cuticular hairs and surrounded by compact mass of glandular cells. Genital pore sinistral, between intestinal bifurcation and acetabulum. Ovary pretesticular, dorsal or posterodorsal to acetabulum on the right of median line. Receptaculum seminis absent. Uterus occupying entire available space of hindbody. Eggs thick-shelled, embryonated. Vitelline follicles massed together around beginning of intestine. Excretory vesicle Y-shaped, arms reaching to level of esophagus or pharynx. Parasitic in marine fishes.

Genotype: *P. hoplognathi* Yamaguti, 1940 (Pl. 1, Fig. 13; Pl. 3, Figs. 32—33), in intestine of *Hoplognathus punctata*; Hamazima, Japan.

PSEUDOSTERINGOPHORUS Yamaguti,1940

Fellodistomatidae. Body small,unarmed. Oral sucker terminal with longitudinal aperture. Prepharynx very short.Esophagus moderately long. Ceca simple, half long. Acetabulum far from oral sucker. Testes symmetrical, postacetabular. Cirrus sac preacetabular, srongly muscular, containing bipartite seminal vesicle, prostatic cells. Cirrus projecting into genital atrium. Genital atrium muscular, developing at its base anterodorsal outgrowth surrounded by compact mass of gland cells. Genital pore in left submedian line bewteen acetabulum and bifurcation. Ovary entire, pretesticular dorsal or posterodorsal to acetabulum on right of median line. Seminal receptacle absent. L.canal present. Uterus filling all available space of hindbody. Eggs thick-shelled. Vitellaria follicular, massed around anterior swollen part of excretory arms and beginning of intestine. Excretory vesicle Y-shaped with arms reaching to esophagus or pharynx. Parasitic in marine fishes.

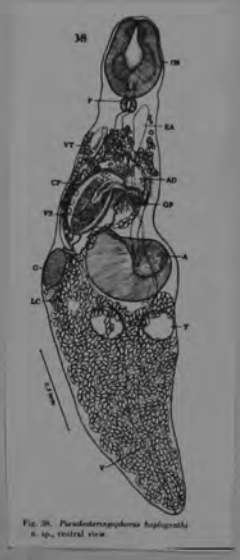
Type species P.hoplognathi

Pseudosteringóphorus hoplognathi Yamaguti,1941

Body fusiform, 1.1 to 1.8 by 0.3 to 0.48 mm.
Oral sucker 0.16 to 0.28 long; 0.1 to 0.2 wide
Acetabulum bowl-shaped, 0.175 to 0.31 mm. wide, near midbody.
Ceca end at acetabulo-ovarian level.
Testes rounded, one on each side behind acetabulum.
Ovary oval, dexdrodorsal to acetabulum.
Metraterm not distinctly differentiated.
Eggs 27 to 34 by 15 to 20 u as fixed in alcohol and measured in water.

Host: Hoplognatus punctatus
Japan; Hamazima

Differs from Steringophorus in more anterior vitellaria and by the atrial outgrowth and glands.



PSEUDOSTERINGO-
PHORUS.